

**American National Standard**

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



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***American National Standard  
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 March 9, 1993***

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***Abstract*** In the interests of safety and interchangeability, this Standard provides pressure and velocity performance and dimensional characteristics for centerfire pistol and revolver ammunition. Included are procedures and equipment for determining these criteria.

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## **Foreword**

The development of this voluntary industry performance standard was initiated under the auspices of the Sporting Arms & Ammunition Manufacturers' Institute, Inc. (SAAMI). A Product Standards Task Force was established by the Institute in 1975 and charged with the drafting of this and other standards and 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as one who produces ammunition by fabricating component parts from raw materials as opposed to remanufacture with parts originally made by others.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 Ammunition was first published in 1979. Subsequently it was revised at five year intervals, in 1984, 1990 and now again in 1993. Changes in the standard with each revision include minor adjustments of velocities, the addition of new load offerings, an 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., 11 Mile Hill Road, Newtown, Connecticut 06470.

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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CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

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SECTION I - CHARACTERISTICS  
CENTERFIRE PISTOL & REVOLVER  
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CARTRIDGES AND CHAMBERS  
FULL AND ABBREVIATED NAMES

The following tabulations list recommended full names and abbreviated names of the centerfire pistol and revolver cartridges and chambers currently supplied for various types of firearms.

In order of listing, all Metric cartridges - first in ascending numerical order of approximate caliber designation, then alphabetical order followed by: American cartridges - first in ascending numerical order of approximate caliber designations, then alphabetical order.

All 2 digit numbers.

2 digits and hyphen followed by more numbers.

3 digit numbers.

For any cartridge name with several bullet weights, list in ascending numerical order of bullet weights.

Cartridges and Chambers

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<u>Full Name</u>	<u>Abbreviated Name</u>
6mm BR Remington	6mm BR-Rem
7mm BR Remington	7mm BR-Rem
9mm Luger	9mm Luger
9mm Luger +P *	9mm Luger +P *
9mm Winchester Magnum	9mm Win Mag
10mm Automatic	10mm Auto
22 Remington Jet Magnum	22 Rem Jet Mag
221 Remington Fireball	221 Rem Fireball
25 Automatic	25 Auto
256 Winchester Magnum	256 Win Mag
30 Luger (7.65mm)	30 Luger (7.65mm)
32 Automatic	32 Auto
32 Colt New Police	32 CNP
32 H&R Magnum	32 H&R Mag
32 Long Colt	32 LC
32 Short Colt	32 SC
32 Smith & Wesson	32 S&W
32 Smith & Wesson Long	32 S&WL
357 Magnum	357 Mag
357 Remington Maximum	357 Rem Max
38 Automatic	38 Auto

- \* 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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CARTRIDGES AND CHAMBERS  
FULL AND ABBREVIATED NAMES

CARTRIDGES AND CHAMBERS (Continued)

<u>Full Name</u>	<u>Abbreviated Name</u>
38 Colt New Police	38 CNP
38 Long Colt	38 LC
38 Short Colt	38 SC
38 Smith & Wesson	38 S&W
38 Special	38 Spl
38 Special Match	38 Spl Match
38 Special +P *	38 Spl +P *
38 Super Automatic +P *	38 Super Auto +P *
380 Automatic	380 Auto
40 Smith & Wesson	40 S&W
41 Action Express	41 AE
41 Remington Magnum	41 Rem Mag
44 Remington Magnum	44 Rem Mag
44 Smith & Wesson Special	44 S&W Spl
45 Automatic	45 Auto
45 Automatic +P *	45 Auto +P *
45 Automatic Match	45 Auto Match
45 Automatic Rim	45 Auto Rim
45 Colt	45 Colt
45 Winchester Magnum	45 Win Mag
50 Action Express	50 AE

\* 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.

SECTION I - CHARACTERISTICS  
CENTERFIRE PISTOL & REVOLVER  
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VELOCITY DATA INTERPRETATION

Velocity specifications are stated on the basis of a nominal mean velocity  $\pm$  90 feet per second, as listed in Section I - pages 11-17.

In the testing of ammunition, subsequent to its manufacture, allowances must be made for factors which can influence both the average and the variability of velocity observed. Factors -- such as, components, sampling error, differences in test methods and equipment, and in the actual test conditions may influence the observed results.

The specifications include allowances for these sources of variation, which are standardized and controlled during the manufacturing cycle, but may vary considerably in subsequent test.

Manufacturers of ammunition should control velocity during loading at a level which gives reasonable assurance that the product will, in tests subsequent to loading, meet the established specifications.

---

The following procedures are intended to serve as a guide in establishing loading control limits for velocity which are compatible with the established values. These procedures, based on a modification of the concept of Reject Limits for Averages, permit maximum latitude in loading control while providing adequate assurance that velocity specifications are met.

SECTION I - CHARACTERISTICS  
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VELOCITY DATA INTERPRETATION

This procedure requires that a good estimate of sigma prime ( $\sigma'$ ) be developed through analysis of the within-sample variation of velocity. Sigma prime is most easily determined by finding the average range (or extreme variation) within samples of size 10 rounds or less and using the factor  $d_2$  to convert the average range to  $\sigma'$ . For sample sizes greater than 10, calculate the standard deviation of each sample and determine the average standard deviation  $\bar{\sigma}$ . Divide  $\bar{\sigma}$  by the factor  $c_2$  to obtain an estimate of  $\sigma'$ .

(Note: Most texts on Quality Control contain tables of  $c_2$  and  $d_2$ ).

The test results from at least 50 samples of  $n$  rounds each, which include data from the loading of several different lots of powder, should be used in developing the value of sigma prime.

Table A contains the factors ( $M_1$ ) which are used as multipliers of  $\sigma'$  in determining the Upper and Lower Reject Limits for sample averages. The specific values for  $M_1$  are given for several levels of assurance and a range of sample sizes. The values of  $t_2$  are taken from a table of critical values for the two-tailed normal distribution. Values of  $M_1$  are calculated as follows

$M_1 = t_2 / \sqrt{n}$  where  $t_2$  is as defined above and  
 $n$  = sample size. For example, the first value  
of  $M_1$  in Table A is computed as follows:

$$1.65 / \sqrt{2} = 1.17$$

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 CENTERFIRE PISTOL & REVOLVER  
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VELOCITY DATA INTERPRETATION

TABLE A  
 FOR TWO SIDED SPECIFICATION FOR AVERAGES  
 MULTIPLIER ( $M_1$ ) OF  $\sigma'$  SHOWN  
 IN THE BODY OF THE TABLE

SELECTED LEVEL OF ASSURANCE	SAMPLE SIZE								
	$t_2$	2	3	4	5	10	15	20	25
90.0	1.65	1.17	.95	.83	.74	.52	.43	.37	.33
95.0	1.96	1.39	1.13	.98	.88	.62	.51	.44	.39
97.5	2.24	1.65	1.35	1.17	1.04	.74	.60	.52	.47
99.0	2.58	1.82	1.49	1.29	1.15	.82	.67	.58	.52
99.5	2.81	2.00	1.62	1.41	1.26	.89	.73	.63	.56
99.73	3.00	2.12	1.73	1.50	1.34	.95	.77	.67	.60

EXAMPLE OF THE USE OF TABLE A

Assume that -

1. The product velocity specification is  $910 \pm 90$  feet per second. Then, the specified limits are 1000 and 820 feet per second.
2. The value of  $\sigma'$  has been determined to be 25 ft/s.
3. The selected level of assurance = 99%.
4. The sample size = 5 rounds.

Calculate the sample average Reject Limits -

$$\text{UPPER REJECT LIMIT} = 1000 - 25 \times 1.15 = 1000 - 28.75 = 971 \text{ ft/s}$$

$$\text{LOWER REJECT LIMIT} = 820 + 25 \times 1.15 = 820 + 28.75 = 849 \text{ ft/s}$$

NOTE: Because of the importance of  $\sigma'$  in this procedure, it is recommended that control charts for the Range (or Extreme Variation) be used to monitor and control the variability of velocity. Procedures for the construction and use of these charts can be found in Quality Control textbooks.

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FACTORS AFFECTING  
PRESSURE MEASUREMENTS  
COPPER CRUSHER

There are three principal factors affecting pressure measurements. These are instrumentation, ammunition and procedure. The following lists the items in each category that may cause difficulties.

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 gage (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 gages and headspace gages.
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 properly mount pressure barrel 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 set-screw face to remove surplus oil.
4. Failure to center crusher cylinder on piston and properly adjust set-screw.
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 empty case and gas check from previous shot.

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

FACTORS AFFECTING  
PRESSURE MEASUREMENTS  
TRANSDUCER

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

There are three principle sources of factors affecting pressure measurements. These are instrumentation, ammunition and procedure. The following lists the principal items in each category that may cause difficulties.

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.
5. Shape, size and protrusion of firing-pin beyond breech face.
6. Force of firing-pin blow.
7. Characteristics of transducer.
8. Quality of transducer.
9. Quality of Read-Out System.

AMMUNITION

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

PROCEDURE

1. Failure to properly mount pressure barrel 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.

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

PRESSURE DATA INTERPRETATION

EXPLANATION OF PRESSURE TERMINOLOGY

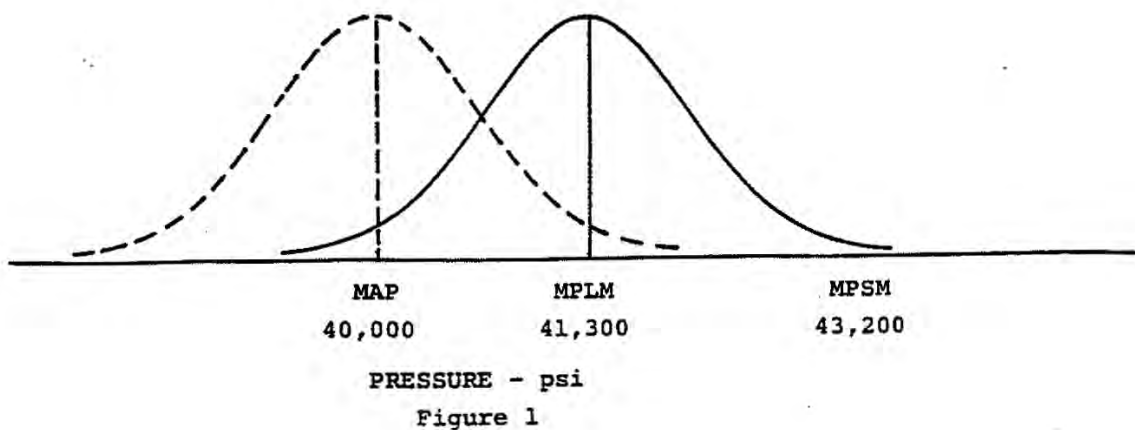
SAAMI recognizes two pressure measuring systems. The preferred system is the piezoelectric transducer system with the transducer flush mounted in the chamber of the test barrel. Pressure developed by the burning propellant exerts force on the transducer through the cartridge case wall causing the transducer 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).

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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. This pressure level is positioned two standard errors below the Maximum Probable Lot Mean (MPLM) pressure in order to assure there is a 97.5% probability that the Maximum Probable Lot Mean pressure is not exceeded. See Figure 1.





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

PRESSURE DATA INTERPRETATION

Standard Deviation (S.D.) - 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 S. D. for a particular MAP multiply the MAP by 0.05 i.e., 40,000 x 0.05 = 2,000 psi.

Standard Error ( $\sigma_{\bar{x}}$ ) - The standard error is calculated by dividing the Standard Deviation (population S. D. =  $\sigma$ ) by the square root of the sample size  $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

Maximum Probable Lot Mean (MPLM) - The MPLM is calculated by adding two standard errors to the Maximum Average Pressure.

The SAAMI pressures are calculated based on a sample size of 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:

---

$$\begin{aligned}\text{MPLM} &= \text{Maximum Average Pressure} + 2 \text{ standard errors} \\ \text{MPLM} &= 40,000 + (633 \times 2) = 40,000 + 1300 = 41,300 \text{ psi}\end{aligned}$$

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 3 standard errors above the Maximum Probable Lot Mean i.e.,  $\text{MPLM} + 3\sigma_{\bar{x}}$ . 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. See 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--- (population S.D.) x 5.16 (table constant for sample of 10 at 99.0% confidence level) i.e., 2,000 x 5.16 = 10,300 psi.

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CENTERFIRE PISTOL & REVOLVER  
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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 which 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, 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, target tables 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.

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

VELOCITY & PRESSURE DATA  
SERVICE LOADS

VELOCITY AND PRESSURE DATA  
CENTERFIRE PISTOL AND REVOLVER CARTRIDGES

Cartridge	Bullet wt. Grs. Type		Velocity in ft/s		Copper Units of Pressure (CUP/100) *		
			Nominal Mean Instr. @15' (± 90) 4"	Nominal Mean Instr. @15' (± 90) Test Ebl.	Maximum Average Pressure (MAP)	Maximum Probable Lot Mean (MPLM)	Maximum Probable Sample Mean (MPSM)
			Vented Ebl.	Test Ebl.			
6mm BR-Rem	100	PSP		2540	520	536	542
7mm BR-Rem	140	PSP		2215	520	536	542
9mm Luger	88	JHP		1500	330	341	357
9mm Luger	95	JSP		1330	330	341	357
9mm Luger	100	JHP		1210	330	341	357
9mm Luger	115	MC		1125	330	341	357
9mm Luger	115	JHP		1145	330	341	357
9mm Luger	115	STHP		1210	330	341	357
9mm Luger	124	MC		1090	330	341	357
9mm Luger	147	MC		985	330	341	357
9mm Win Mag	115	MC		1450**	450	465	487
22 Rem Jet Mag	40	SP		2380	400	413	419
221 Rem Fireball	50	PSP		2520	520	536	542
25 Auto	35	XTP-HP		900	180	186	192
25 Auto	45	XP		805	180	186	192
25 Auto	50	MC-FMC		755**	180	186	192
256 Win Mag	60	HP		2315	430	444	465
30 Luger (7.65mm)	93	MC		1190**	280	289	295
32 Auto	60	STHP		960	150	155	163
32 Auto	71	MC		900**	150	155	163
32 Colt NP	98-100	L		750	120	124	130
32 H&R Mag	85	JHP		1120	210	217	228
32 H&R Mag	95	LSWC		1020	210	217	228
32 Long Colt	82	L		830	130	134	141
32 Short Colt	80	L		700	130	134	141
32 S&W	85-88	L		700	120	124	130
32 S&W Long	98	L		775	120	124	130
357 Mag	110	JHP-SJHP	1270	1650	450	465	487
357 Mag	125	SJHP		1500	450	465	487
357 Mag	125	JSP	1425	1875	450	465	487

\* Based on sample size n = 10.

\*\* Revolvers not commonly chambered for this cartridge.

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

VELOCITY & PRESSURE DAT  
SERVICE LOADS

VELOCITY AND PRESSURE DATA  
 CENTERFIRE PISTOL AND REVOLVER CARTRIDGES

Cartridge	Bullet wt.    Grs.    Type		Velocity in ft/s		Copper Units of Pressure (CUP/100)*		
			Nominal	Nominal	Maximum Average Pressure (MAP)	Maximum Probable Lot Mean (MPLM)	Maximum Probable Sample Mean (MPSM)
			Mean Instr. @15' (± 90)	Mean Instr. @15' (± 90)			
			4"    Vented Bbl.	4"    Test Bbl.			
357 Mag	125	SP-SJHP	1425	1875	450	465	487
357 Mag	140	SJHP	1330	1750	450	465	487
357 Mag	145	STHP	1270	1670	450	465	487
357 Mag	158	MP-L	1220	1545	450	465	487
357 Mag	158	SWC-SWCHP	1220	1545	450	465	487
357 Mag	158	SP-SJHP	1220	1600	450	465	487
357 Mag	180	STHP		1400	450	465	489
357 Rem Max	158	SJHP	1800***	1950	480	495	501
357 Rem Max	180	JHP	1530***	1750	480	495	501
38 Auto	130	MC		1035**	230	238	249
38 Colt NP	150	L		710	120	124	130
38 Long Colt	150	L		725	120	124	130
38 Short Colt	125	L		775	120	124	130
38 Long Colt	130	L		725	120	124	130
38 S&W	145-146	L		680	130	134	141
38 Spl	110	STHP	945	1150	170	176	184
38 Spl	125	NLSWCHP		1050	170	176	184
38 Spl	158	MP-L-SWC	750	900	170	176	184
38 Spl	200	L	630	780	170	176	184
38 Spl +P	95	STHP	1080	1330	200	206	212
38 Spl +P	95	SJHP	1155	1420	200	206	212
38 Spl +P	110	JHP-SJHP	980	1205	200	206	212
38 Spl +P	125	JSP-SJHP-JHP	940	1120	200	206	212
38 Spl +P	147	JHP	855	985	200	206	212
38 Spl +P	150	L	840	1050	200	206	212
38 Spl +P	158	SWC-LHP-L	880	1050	200	206	212
38 Super Auto+P	115	JHP		1280**	330	341	357
38 Super Auto+P	125	JHP-MC-STHP		1230**	330	341	357
38 Super Auto+P	130	FMC		1200**	330	341	357
380 Auto	85	STHP		990**	170	176	184
380 Auto	88-90	JHP		980**	170	176	184

\* Based on sample size n = 10.

\*\* Revolvers not commonly chambered for this cartridge.

\*\*\* .004" Vent - 10-1/2" Bbl.

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

VELOCITY & PRESSURE D  
 SERVICE LOADS

VELOCITY AND PRESSURE DATA  
 CENTERFIRE PISTOL AND REVOLVER CARTRIDGES  
 (Continued)

Cartridge	Bullet wt. Grs. Type		Velocity in ft/s		Copper Units of Pressure (CUP/100) *		
			Nominal		Maximum Average Pressure (MAP)	Maximum Probable Lot Mean (MPLM)	Maximum Probabl Sample Mean (MPSM)
			Mean Instr. @15' (± 90) 4"	Nominal Mean Instr. @15' (± 90) Test Ebl.			
380 Auto	95	MC		945**	170	176	184
380 Auto	100	FMJ		910	170	176	184
41 Rem Mag	170	STHP	1400	1800	400	413	419
41 Rem Mag	175	STHP	1250	1490	400	413	419
41 Rem Mag	210	L	955	1125	400	413	419
41 Rem Mag	210	SP-SJHP-JHP	1280	1585	400	413	419
44 Rem Mag	180	JHP	1600	1800	400	413	419
44 Rem Mag	210	STHP	1250	1425	400	413	419
44 Rem Mag	220	MCP		1580	400	413	419
44 Rem Mag	240	L-SWC	995***	1175	400	413	419
44 Rem Mag	240	L	1335	1600	400	413	419
44 Rem Mag	240	SP-JHP	1170	1600	400	413	419
44 Rem Mag	250	MLP		1520	400	413	419
44 Rem Mag	300	XTP-HP		1200	400	413	419
44 S&W Spl	200	STHP		900	140	144	150
44 S&W Spl	200	SWCHP		1025	140	144	150
44 S&W Spl	246	L		800	140	144	150
45 Auto	120	#12 Shot		1200	180	186	192
45 Auto	185	STHP-JHP		995**	180	186	192
45 Auto	185	JHP		930**	180	186	192
45 Auto	230	MC-FMC		830**	180	186	192
45 Auto Rim	230	L		825	150	155	163
45 Colt	225	STHP		915	140	144	150
45 Colt	225	SWCHP-SWC		950	140	144	150
45 Colt	250-255	L		900	140	144	150
45 Win Mag	230	MC		1380**	400	413	419

\* Based on sample size n = 10.

\*\* Revolvers not commonly chambered for this cartridge.

\*\*\* 6-1/2" vented barrel.

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

VELOCITY & PRESSURE DATA  
SERVICE LOADS

VELOCITY AND PRESSURE DATA  
 CENTERFIRE PISTOL AND REVOLVER CARTRIDGES  
 (Continued)

Cartridge	Bullet wt. Grs. Type	Velocity in ft/s		Copper Units of Pressure (CUP/100) *		
		Nominal	Nominal	Maximum	Maximum	Maximum
		Mean Instr.	Mean Instr.	Average	Probable	Probable
		@15' ( $\pm 90$ )	@15' ( $\pm 90$ )	Pressure	Lot Mean	Sample
		4"	Test Bbl.	(MAP)	(MPLM)	Mean
		Vented Bbl.				(MPSM)
<u>MATCH***</u>						
38 Spl Match	148 LWC	700	800	170	176	184
38 Spl Match	158 L	750	900	170	176	184
45 Auto	185 MCWC		765**	180	186	192

\* Based on sample size n = 10.

\*\* Revolvers not commonly chambered for this cartridge.

\*\*\* The velocity figures listed above for Match items are nominal values; optimum accuracy may require a velocity different from the nominal figure.

NOTE: (1) Where manufacturer's practices produce values different in any respect from those tabulated, those practices and the results therefrom shall be considered acceptable when they are equivalent.

(2) See Section I for abbreviations for types of bullets.

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

VELOCITY & PRESSURE DATA  
 TRANSDUCER

CENTERFIRE PISTOL & REVOLVER VELOCITY AND PRESSURE DATA  
 PRESSURES BASED ON PIEZOELECTRIC TRANSDUCER SYSTEM

Cartridge	Bullet wt. Grs. Type		Velocity in ft/s		Pressure Limits (psi/100) *		
			Nominal Mean Instr. @15' (± 90) 4" Vented Bbl.	Nominal Mean Instr. @15' (±90) Test Bbl.	Maximum Average Pressure (MAP)	Maximum Probable Lot Mean (MPLM)	Maximum Probable Sample Mean (MPSM)
9mm Luger	88	JHP		1500	350	361	378
9mm Luger	95	JSP		1330	350	361	378
9mm Luger	100	JHP		1210	350	361	378
9mm Luger	115	MC		1125	350	361	378
9mm Luger	115	JHP		1145	350	361	378
9mm Luger	115	STHP		1210	350	361	378
9mm Luger	124	MC		1090	350	361	378
9mm Luger	147	JHP		985	350	361	378
9mm Luger +P	115	JHP		1235	385	397	415
10mm Auto	155	HP/XP		1410	375	387	405
10mm Auto	155	FMJ		1115	375	387	405
10mm Auto	170	HP/XP		1320	375	387	405
10mm Auto	175	STHP		1275	375	387	405
10mm Auto	200	FMJ/FP		1150	375	387	405
10mm Auto	200	SXT		985	375	387	405
25 Auto	35	XTP-HP		900	250	258	270
25 Auto	45	XP		805	250	258	270
25 Auto	50	MC-FMC		755**	250	258	270
32 Auto	60	STHP		960	205	211	221
32 Auto	71	MC		950**	205	211	221
32 S&W Long	98	L		775	150	155	163
357 Mag	110	JHP-SJHP	1270	1650	350	361	378
357 Mag	125	SJHP		1500	350	361	378
357 Mag	125	JSP	1425	1875	350	361	378
357 Mag	125	SP-SJHP	1425	1875	350	361	378
357 Mag	145	STHP	1270	1670	350	361	378
357 Mag	158	MP-L	1220	1545	350	361	378
357 Mag	158	SWC-SWCHP	1220	1545	350	361	378
357 Mag	158	SP-SJHP	1220	1600	350	361	378
357 Mag	180	JHP		1400	350	361	378

\* Based on sample size, n = 10

\*\* Revolvers not commonly chambered for this cartridge.

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

VELOCITY & PRESSURE DATA  
TRANSDUCER

CENTERFIRE PISTOL & REVOLVER VELOCITY AND PRESSURE DATA  
PRESSURES BASED ON PIEZOELECTRIC TRANSDUCER SYSTEM

Cartridge	Bullet wt.    Grs.    Type		Velocity in ft/s		Pressure Limits (psi/100) *		
			Nominal Mean Instr. @15' ( ± 90)	Nominal Mean Instr. @15' ( ± 90)	Maximum Average Pressure	Maximum Probable Lot Mean	Maximum Probable Sample Mean
			4" Vented Bbl.	Test Bbl.	(MAP)	(MPLM)	(MPSM)
357 Rem Max	158	SJHP	1800	1950	400	413	432
357 Rem Max	180	JHP	1530	1750	400	413	432
38 Auto	130	MC		1035**	265	273	285
38 S&W	145-146	L		680	145	149	156
38 Spl	110	STHP	945	1150	170	176	184
38 Spl	125	NLSWCHP		1050	170	176	184
38 Spl	158	MP-L-SWC	750	900	170	176	184
38 Spl	200	L	630	780	170	176	184
38 Spl +P	95	STHP	1080	1330	185	191	199
38 Spl +P	95	SJHP	1155	1420	185	191	199
38 Spl +P	110	JHP-SJHP	980	1205	185	191	199
38 Spl +P	125	JSP-SJHP-JHP	940	1120	185	191	199
38 Spl +P	147	JHP	855	975	185	191	199
38 Spl +P	150	L	840	1050	185	191	199
38 Spl +P	158	SWC-LHP-L	880	1050	185	191	199
38 Super Auto+P	115	JHP		1280**	365	376	393
38 Super Auto+P	125	JHP-MC-STHP		1230**	365	376	393
38 Super Auto+P	130	FMC		1200**	365	376	393
380 Auto	85	STHP		990**	215	222	233
380 Auto	88-90	JHP		980**	215	222	233
380 Auto	95	MC		945**	215	222	233
380 Auto	100	FMJ		910	215	222	233
40 S&W	180	JHP		985	350	361	378
40 S&W	155	STHP		1195	350	361	378
40 S&W	155	FMJ		1115	350	361	378
41 AE	180	PHP		1000	350	361	378
41 Rem Mag	170	STHP	1400	1800	360	371	388
41 Rem Mag	175	STHP	1250	1490	360	371	388

\* Based on sample size, n = 10.

\*\* Revolvers not commonly chambered for this cartridge.



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

VELOCITY & PRESSURE DATA  
TRANSDUCER

CENTERFIRE PISTOL & REVOLVER VELOCITY AND PRESSURE DATA  
PRESSURES BASED ON PIEZOELECTRIC TRANSDUCER SYSTEM

Cartridge	Bullet wt.	Grs. Type	Velocity in ft/s		Pressure Limits (psi/100) *		
			Nominal Mean Instr. @15' (±90) 4" Vented Bbl.	Nominal Mean Instr. @15' (±90) Test Bbl.	Maximum Average Pressure (MAP)	Maximum Probable Lot Mean (MPLM)	Maximum Probable Sample Mean (MPSM)
41 Rem Mag	210	L	955	1125	360	371	388
41 Rem Mag	210	SP-SJHP-JHP	1280	1585	360	371	388
44 Rem Mag	180	JHP	1600	1800	360	371	388
44 Rem Mag	210	STHP	1250	1425	360	371	388
44 Rem Mag	220	MCP		1580	360	371	388
44 Rem Mag	240	L-SWC	995***	1175	360	371	388
44 Rem Mag	240	L	1335	1600	360	371	388
44 Rem Mag	240	SP-JHP	1170	1600	360	371	388
44 Rem Mag	250	MLP		1520	360	371	388
44 Rem Mag	300	XTP-HP		1200	360	371	388
44 S&W Spl	246	L		800	155	160	168
45 Auto	120	#12 Shot		1200	210	217	228
45 Auto	185	STHP-JHP		995**	210	217	228
45 Auto	185	JHP		930**	210	217	228
45 Auto	230	MC-FMC		830**	210	217	228
45 Auto +P	185	JHP		1130	230	238	249
45 Colt	225	STHP		915	140	144	151
45 Colt	225	SWCHP-SWC		950	140	144	151
45 Colt	250-255	L		900	140	144	151
50 AE	325	PHP		1400	350	361	378

MATCH\*\*\*\*

38 Spl Match	148	LWC	700	800	170	176	184
38 Spl Match	158	L	750	900	170	176	184
45 Auto	185	MCWC		765**	210	217	228

\* Based on sample size, n = 10

\*\* Revolvers not commonly chambered for this cartridge.

\*\*\* 6-1/2" vented barrel.

\*\*\*\* The velocity figures listed above for Match items are nominal values;  
 optimum accuracy may require a velocity different from the nominal figure.

NOTE:

- (1) Where manufacturer's practices produce values different in any respect from those tabulated, those practices and the results therefrom shall be considered acceptable when they are equivalent.
- (2) See Section I for abbreviations for types of bullets.

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

VELOCITY AND PRESSURE DATA  
BULLET TYPE ABBREVIATIONS

Lead

L	Lead
LWC	Lead Wadcutter
MP	Metal Point
SWC	Semi Wadcutter
SWCHP	Semi Wadcutter Hollow Point

Jacketed

FP	Flat Point
FMC	Full Metal Case
JHP	Jacketed Hollow Point
JSP	Jacketed Soft Point
MC	Metal Case
MCHP	Metal Case Hollow Point
MCWC	Metal Case Wadcutter
NLSWCHP	Nyclad Lead Semi Wadcutter Hollow Point

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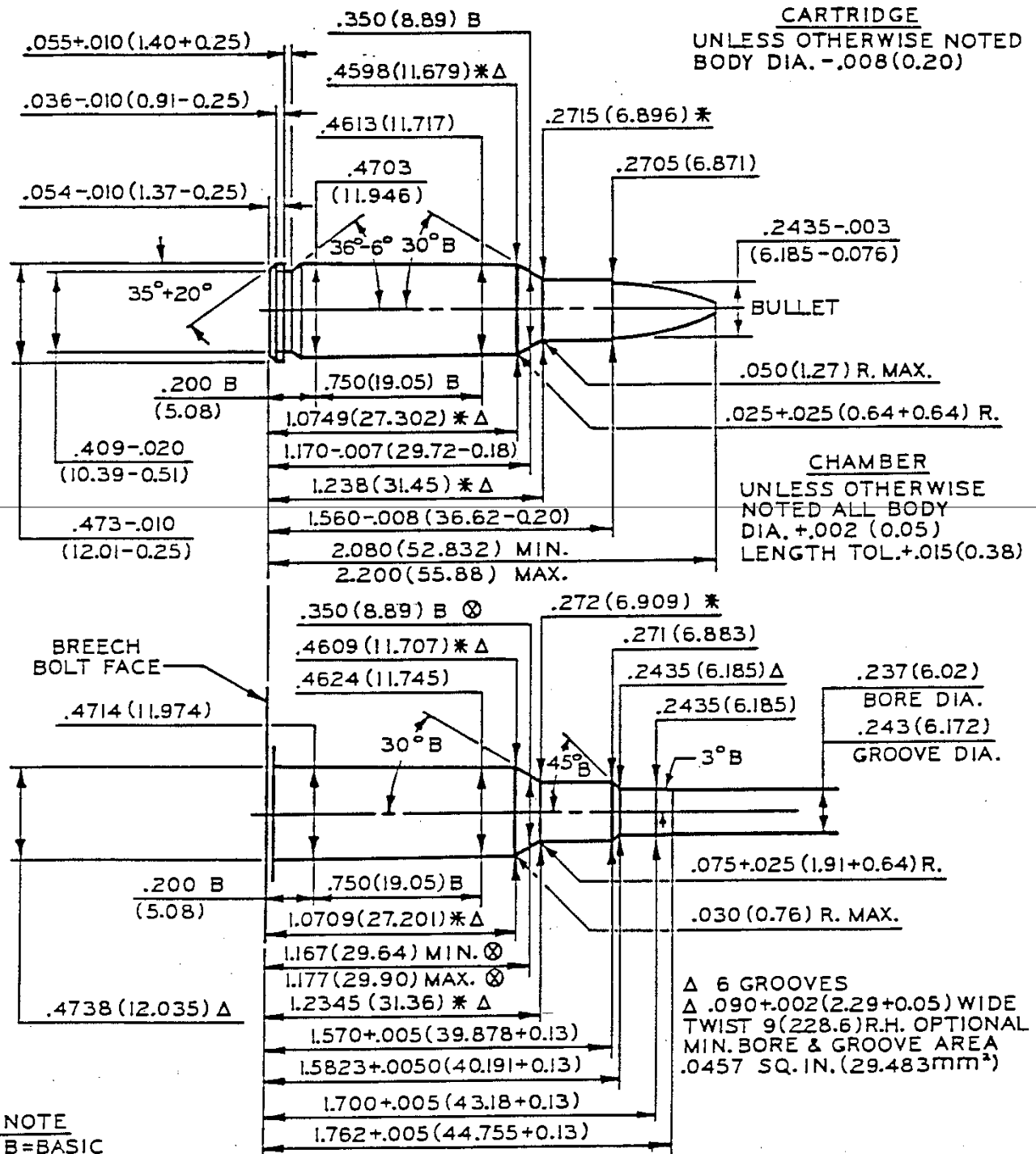
PHP	Plated Hollow Point
PSP	Pointed Soft Point
STHP	Silvertip Hollow Point
SP	Soft Point
SXT	Supreme Expansion Talon
XP	Expanding Point

Semi Jacketed

SJHP	Semi Jacketed Hollow Point
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SECTION I - CHARACTERISTICS  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

CARTRIDGE & CHAMBER  
6mm BENCH REST REMINGTON



CARTRIDGE & CHAMBER  
7mm BENCH REST REMINGTON



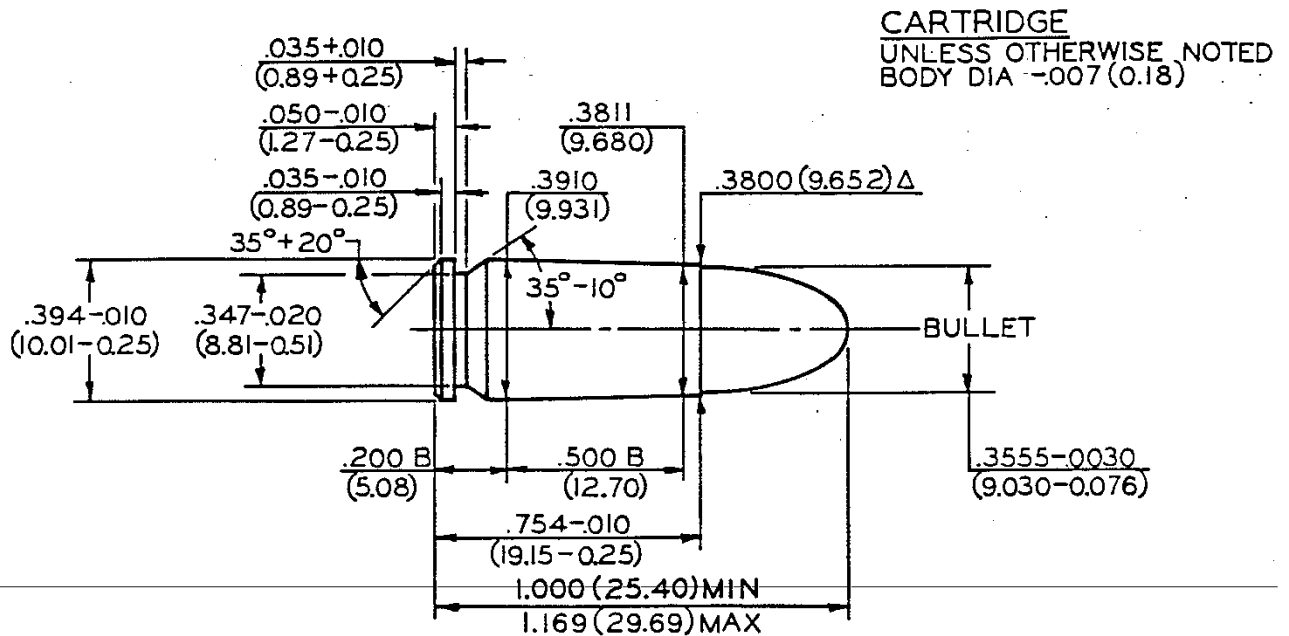
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⊗ = HEADSPACE DIMENSION

$\Delta$  = REFERENCE DIMENSION

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

CARTRIDGE & CHAMBER  
9mm LUGER  
9mm LUGER+P



NOTE

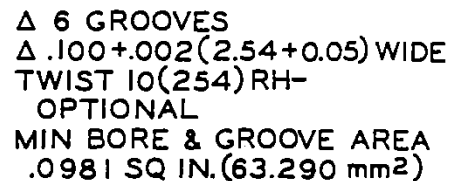
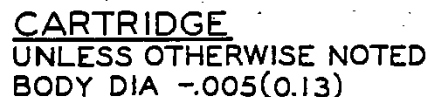
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(XX.XX) = MILLIMETERS      ⊗ = HEADSPACE DIMENSION

\* DIMENSIONS ARE TO INTERSECTION OF LINES      Δ = REFERENCE DIMENSIONS  
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

CHAMBER  
UNLESS OTHERWISE NOTED  
ALL DIA  $+.004(0.10)$   
LENGTH TOL  $+.012(0.30)$

CARTRIDGE & CHAMBER  
9mm WINCHESTER MAGNUM

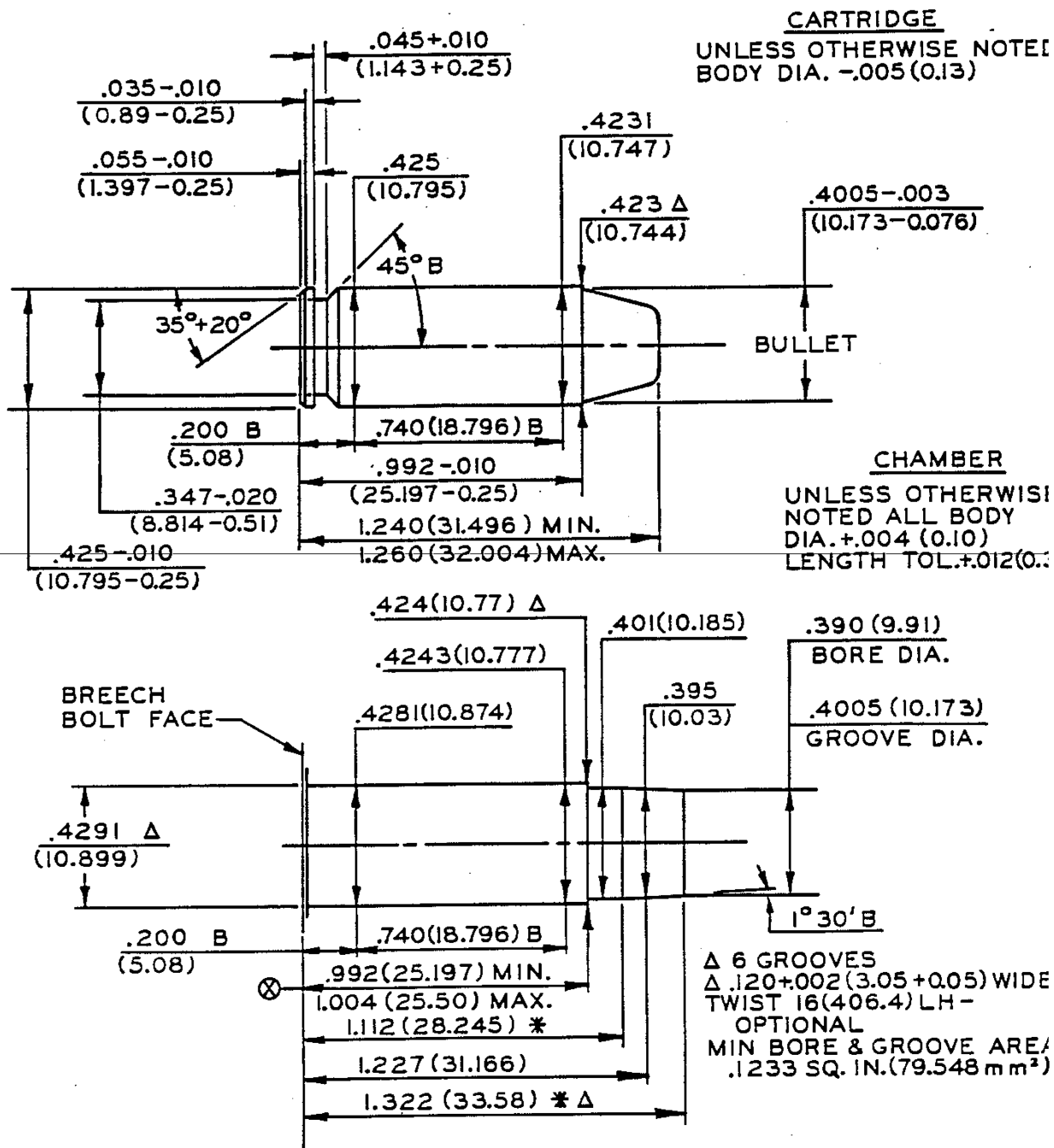


CHAMBER  
UNLESS OTHERWISE NOTED  
ALL DIA +.004(0.10)  
LENGTH TOL +.012(0.30)

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

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

CARTRIDGE & CHAMBER  
10mm AUTOMATIC



NOTE

B = BASIC

(XX.XX) = MILLIMETERS

⊗ = HEADSPACE DIMENSION

\* DIMENSIONS ARE TO INTERSECTION OF LINES

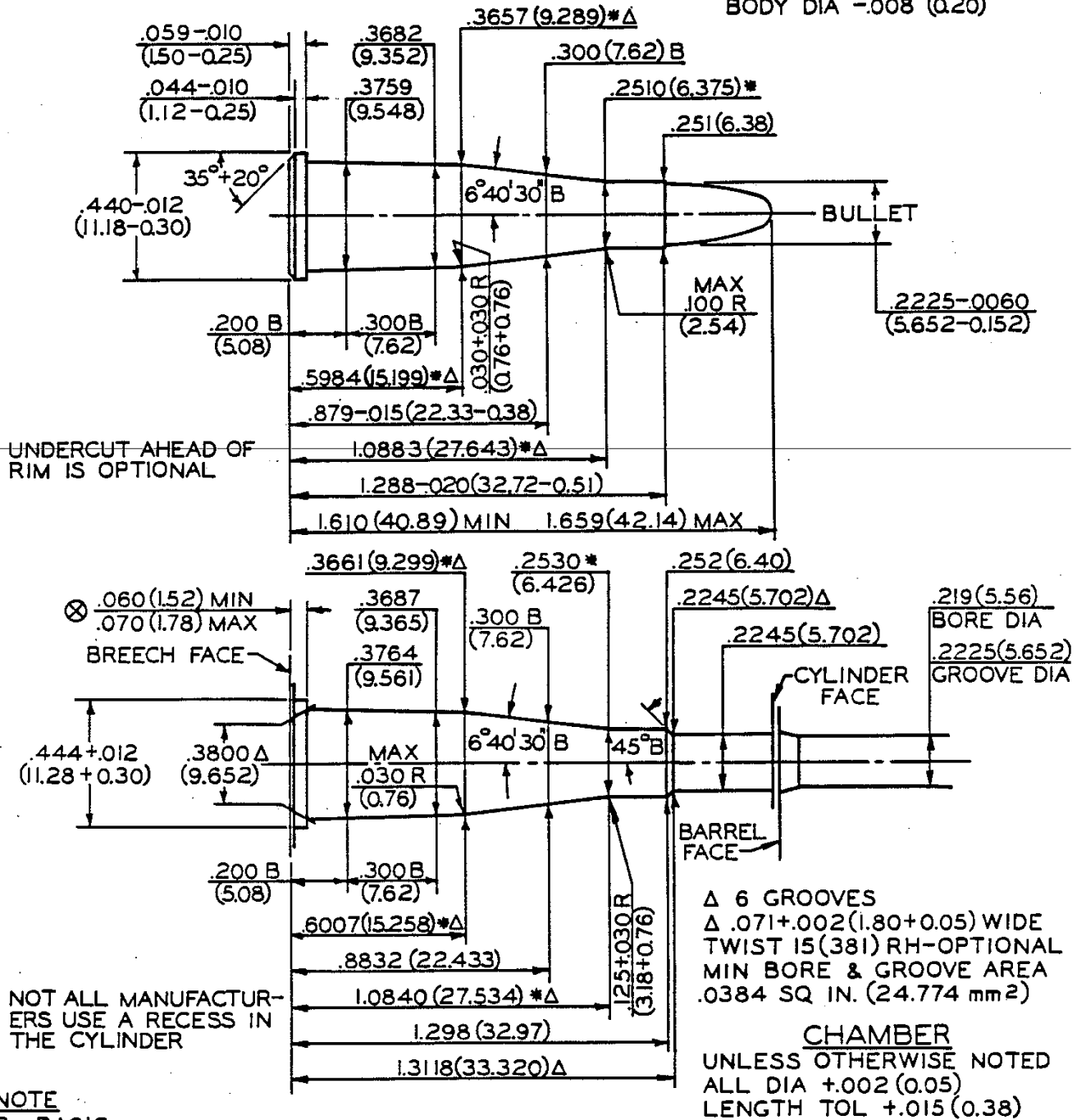
Δ = REFERENCE DIMENSION

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL  
CONDITION (MMC)

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

CARTRIDGE & CHAMBER  
22 REMINGTON JET MAGNUM

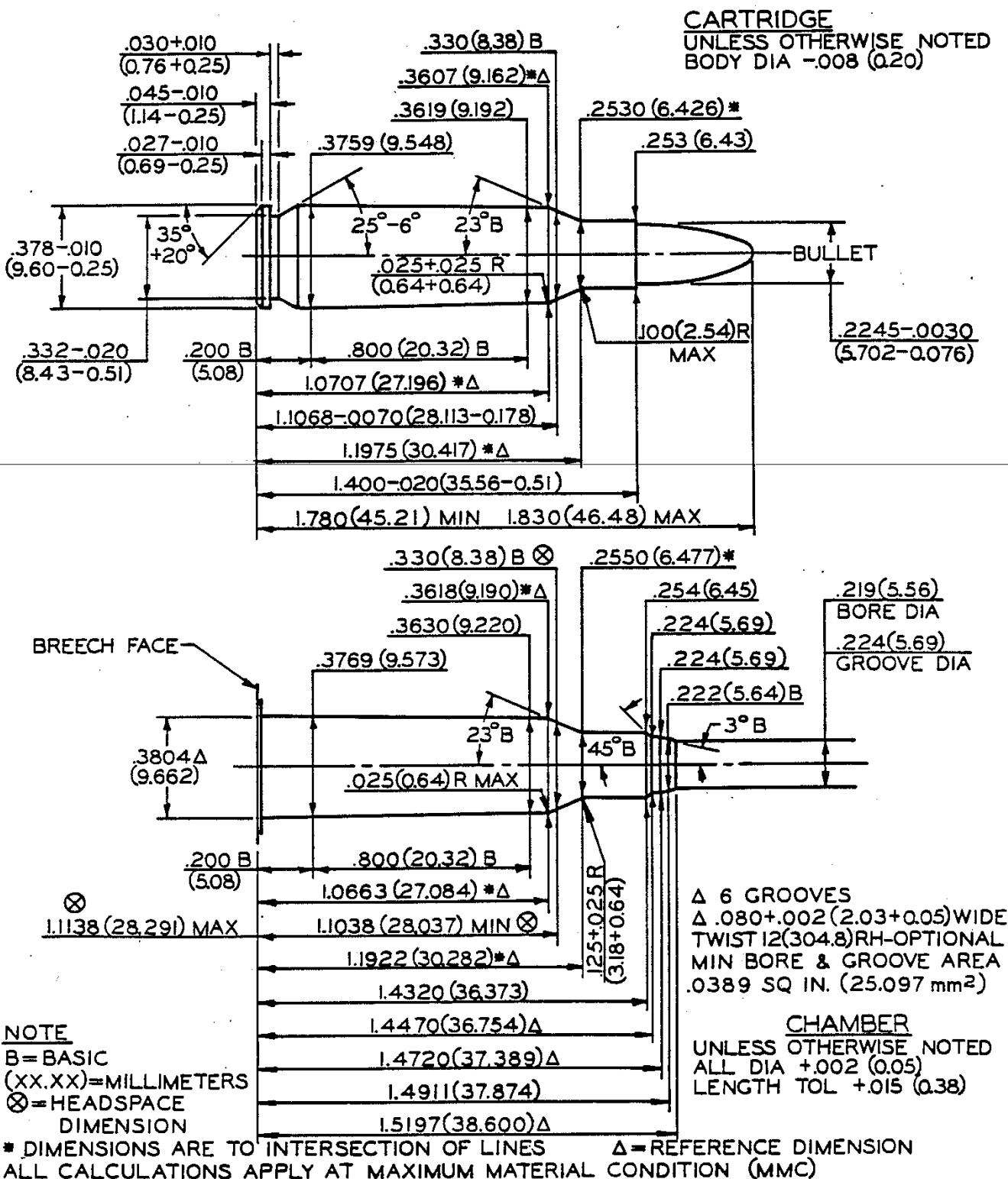
CARTRIDGE  
UNLESS OTHERWISE NOTED  
BODY DIA  $-.008$  (0.20)





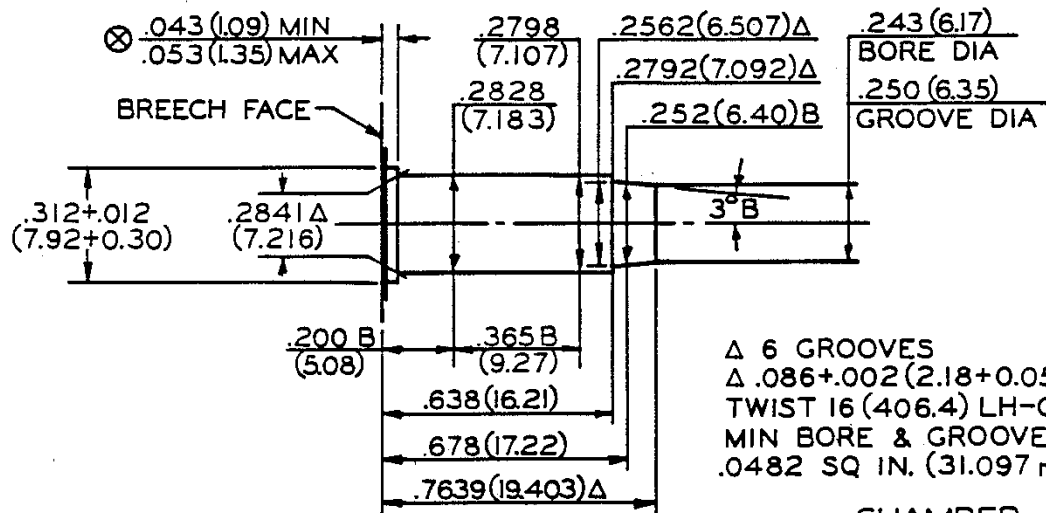
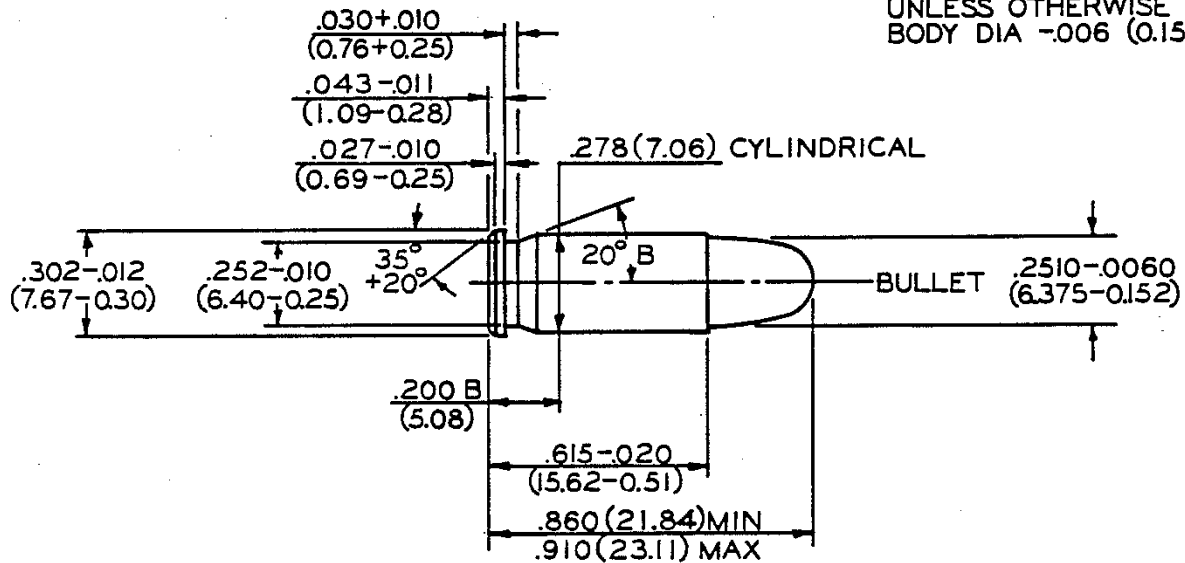
SECTION I - CHARACTERISTICS  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

CARTRIDGE & CHAMBER  
221 REMINGTON FIREBALL



CARTRIDGE & CHAMBER  
25 AUTOMATIC

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

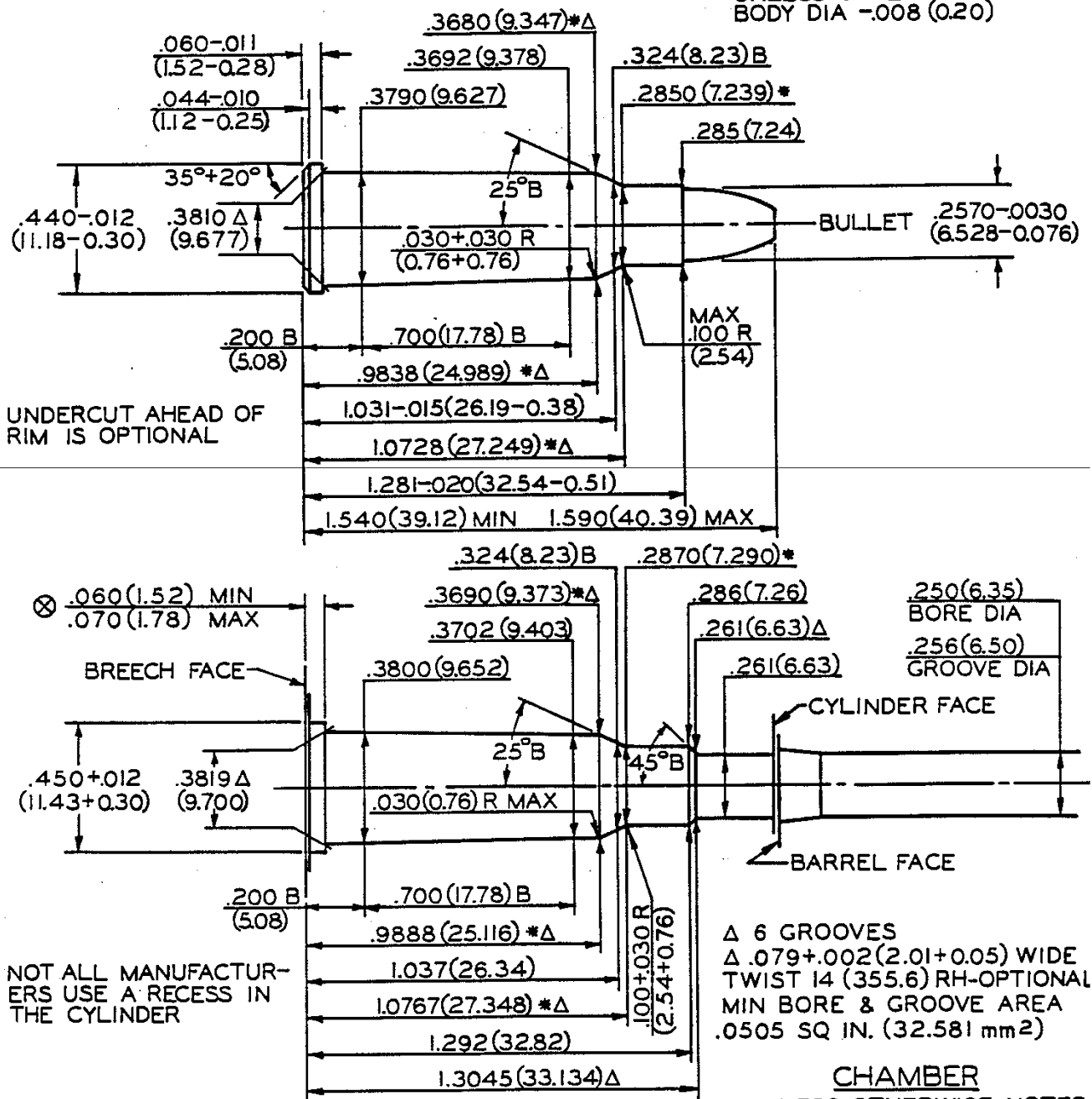


CHAMBER  
UNLESS OTHERWISE NOTED  
ALL DIA +.004 (0.10)  
LENGTH TOL +.015 (0.38)

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

CARTRIDGE & CHAMBER  
256 WINCHESTER MAGNUM

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



ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

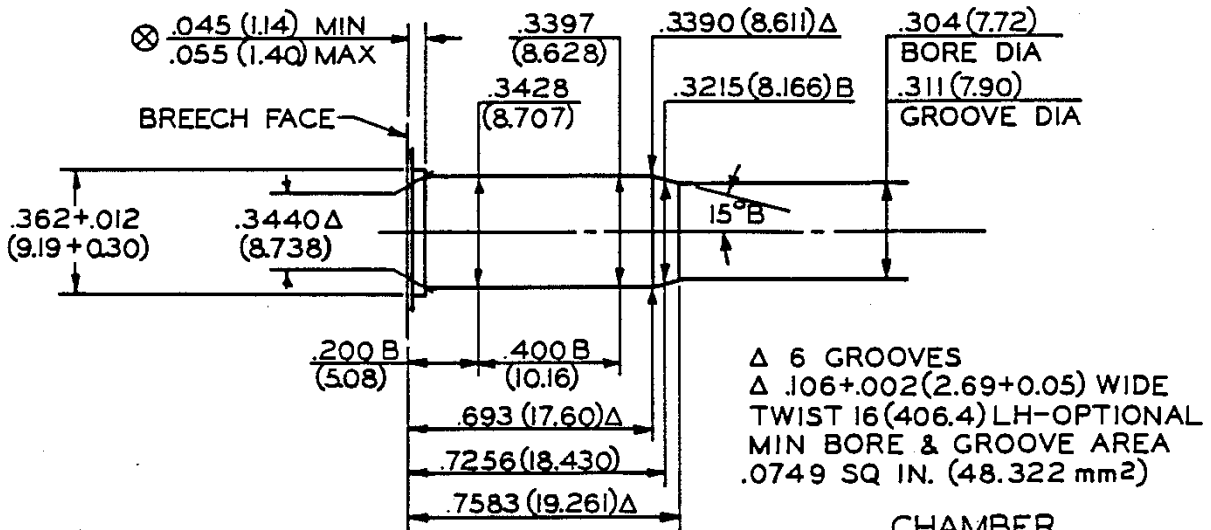
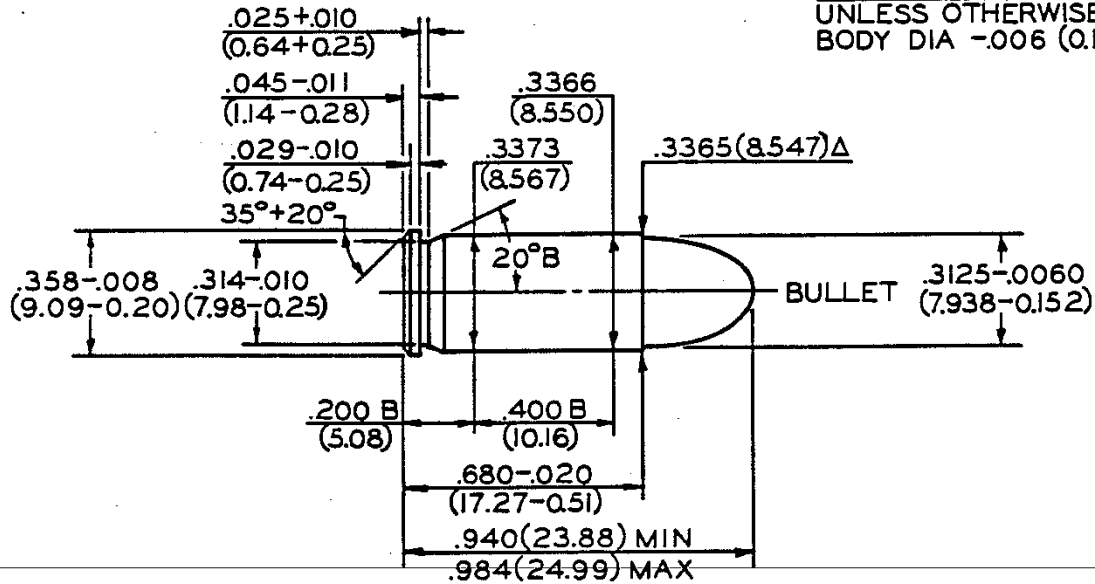
LENGTH TOL +.015(0.38)

CARTRIDGE & CHAMBER  
30 LUGER (7.65mm)



CARTRIDGE & CHAMBER  
32 AUTOMATIC

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



### NOTE

**B=BASIC**

(XX.XX)=MILLIMETERS

⊗ = HEADSPACE DIMENSION

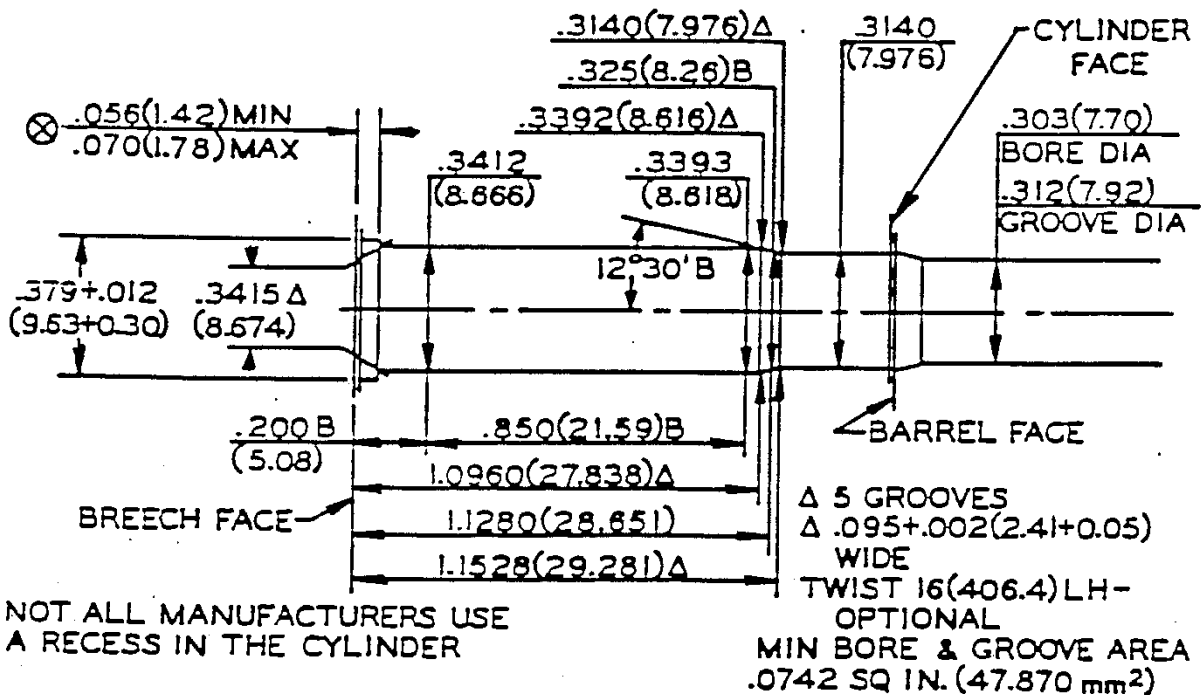
 $\Delta$  = REFERENCE DIMENSION

\* 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 +.015 (0.38)

CARTRIDGE & CHAMBER  
32 H&R MAGNUM

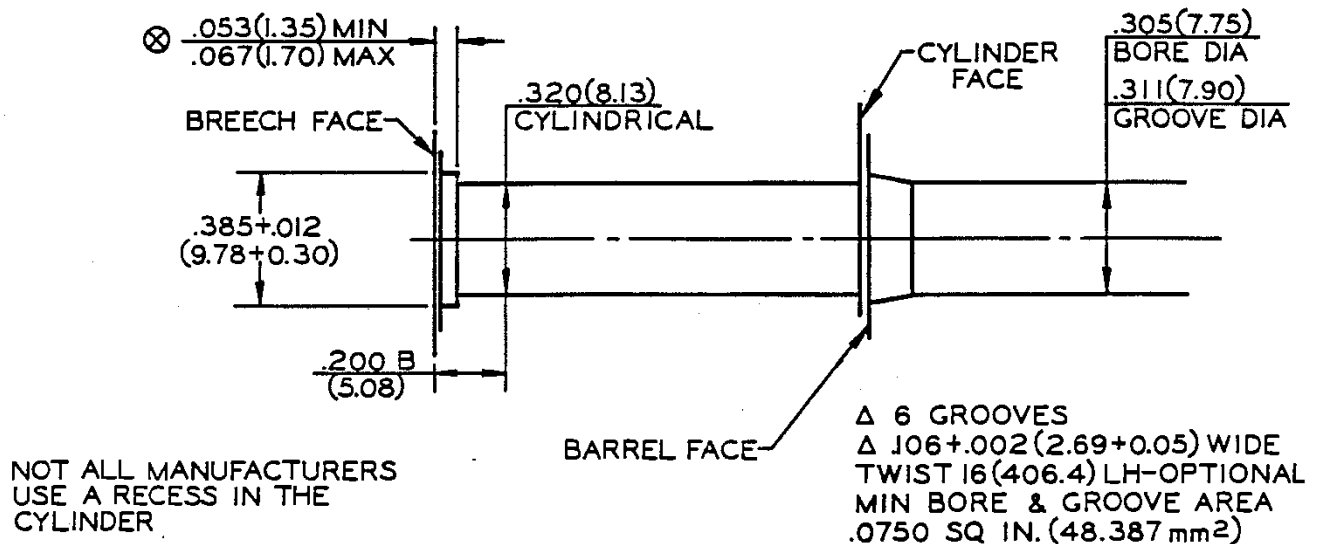
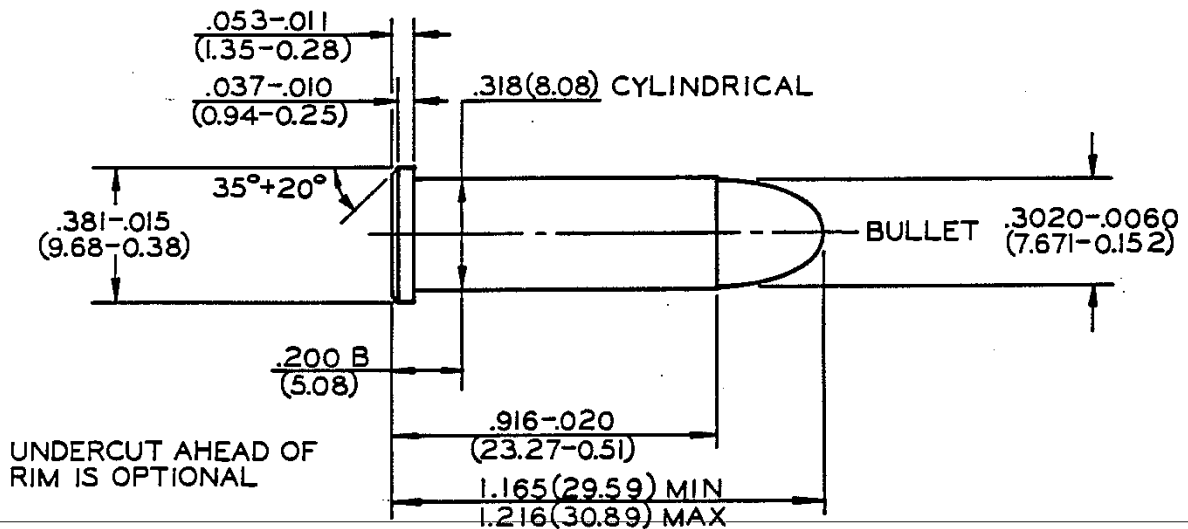


UNLESS OTHERWISE NOTED  
ALL DIA +.004(0.10)  
LENGTH TOL +.015 (0.38)

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

CARTRIDGE & CHAMBER  
32 LONG COLT

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



NOTE

B=BASIC

(XX.XX)=MILLIMETERS

$\otimes$ =HEADSPACE DIMENSION

$\Delta$ =REFERENCE DIMENSION

\* DIMENSIONS ARE TO INTERSECTION OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

CHAMBER

UNLESS OTHERWISE NOTED

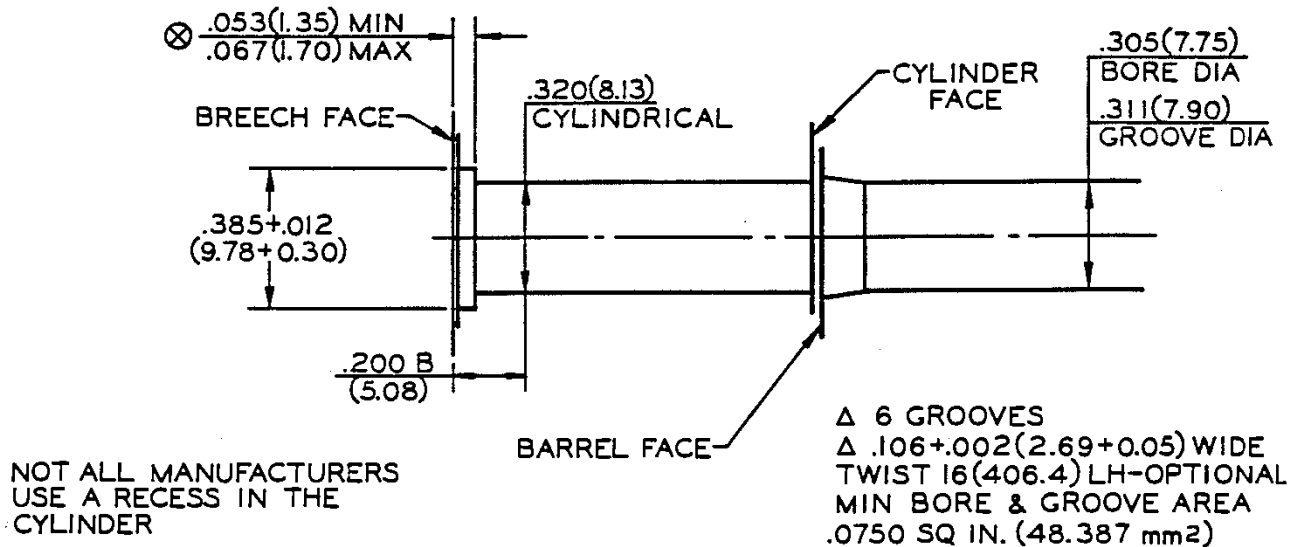
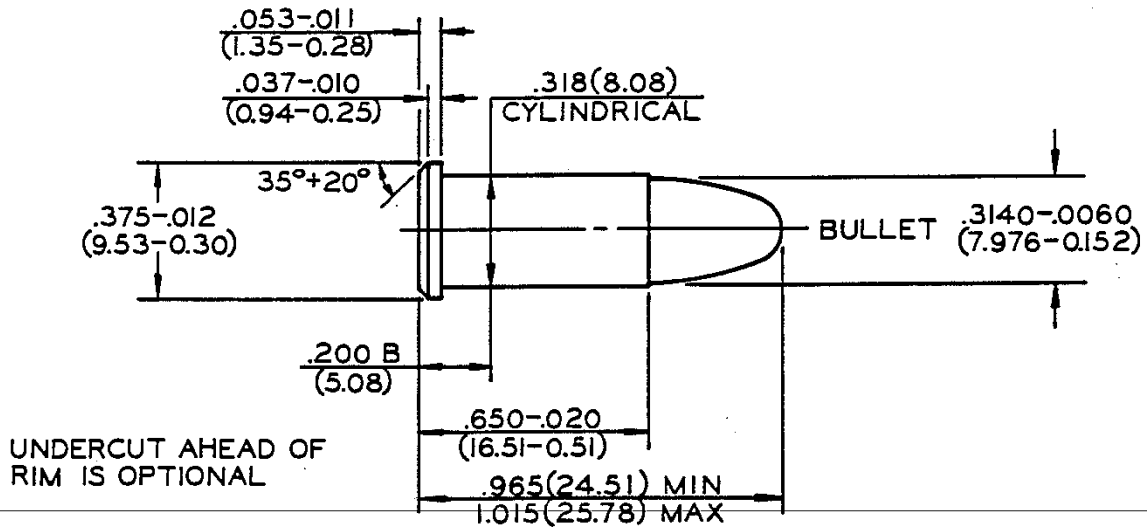
ALL DIA  $+.004(0.10)$

LENGTH TOL  $+.015(0.38)$

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

CARTRIDGE & CHAMBER  
32 SHORT COLT

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



NOTE

B=BASIC

(XX.XX)=MILLIMETERS

⊗=HEADSPACE DIMENSION

Δ=REFERENCE DIMENSION

\* DIMENSIONS ARE TO INTERSECTION OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

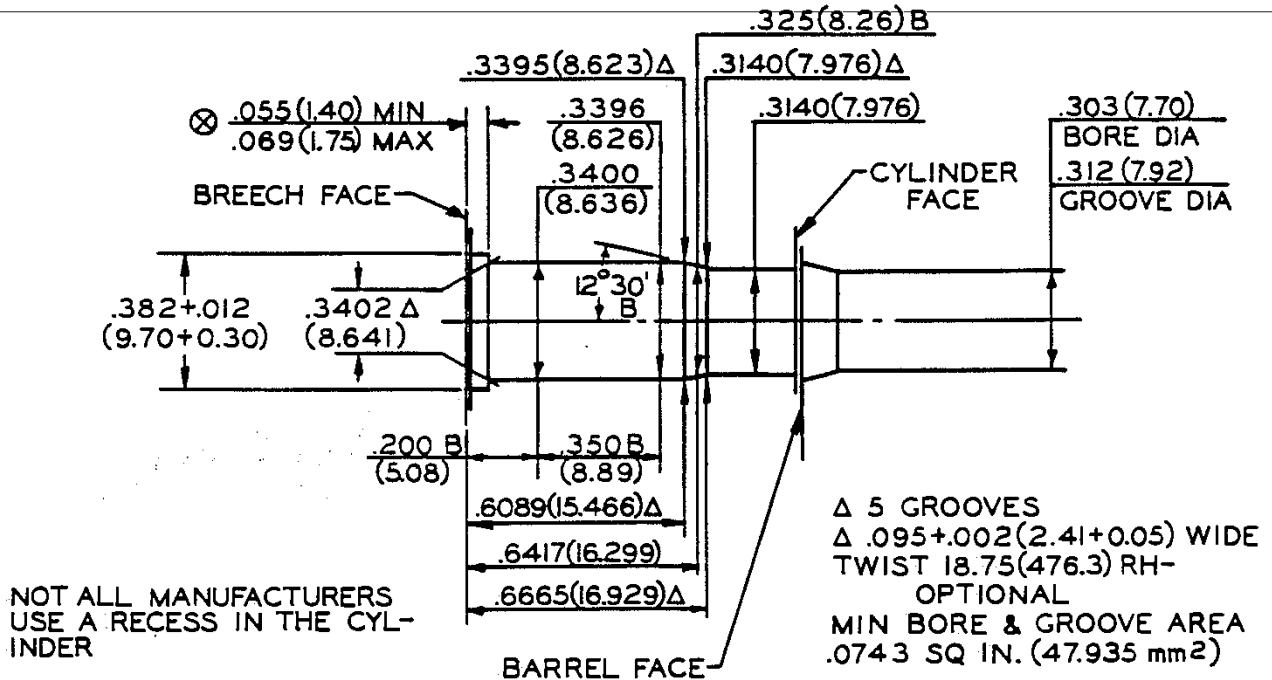
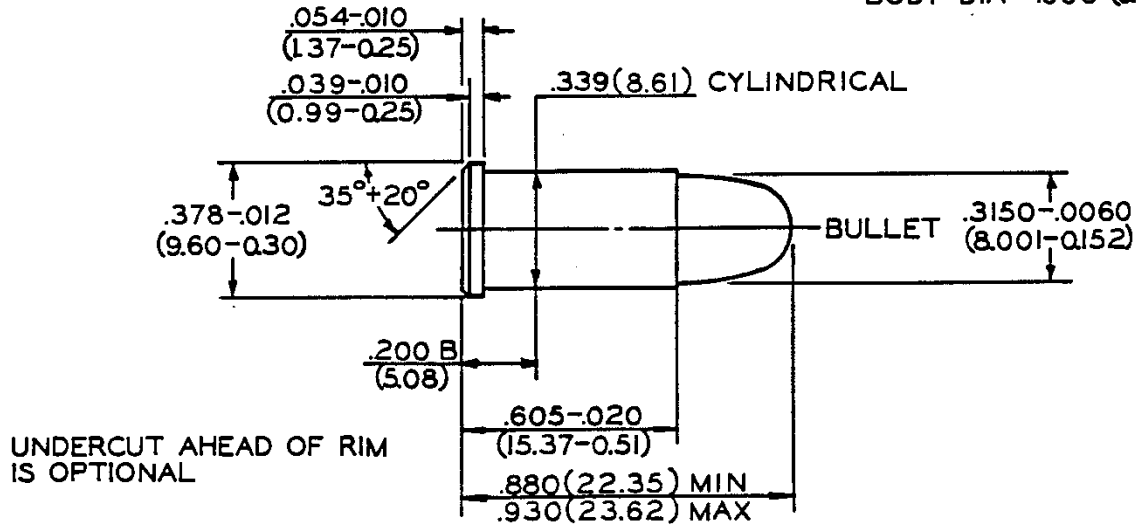
CHAMBER

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



CARTRIDGE & CHAMBER  
32 SMITH & WESSON

CARTRIDGE  
UNLESS OTHERWISE NOTED  
BODY DIA -.006 (Q15)



### NOTE

## B=BASIC

(XX.XX) = MILLIMETERS

⊗ = HEADSPACE DIMENSION

$\Delta$  = REFERENCE DIMENSION

\* DIMENSIONS ARE TO INTERSECTION OF LINES

\* ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

## CHAMBER

UNLESS OTHERWISE NOTED

ALL DIA +.002(0.05)

LENGTH TOL +.015(0.38)

CARTRIDGE & CHAMBER  
32 SMITH & WESSON LONG  
32 COLT NEW POLICE

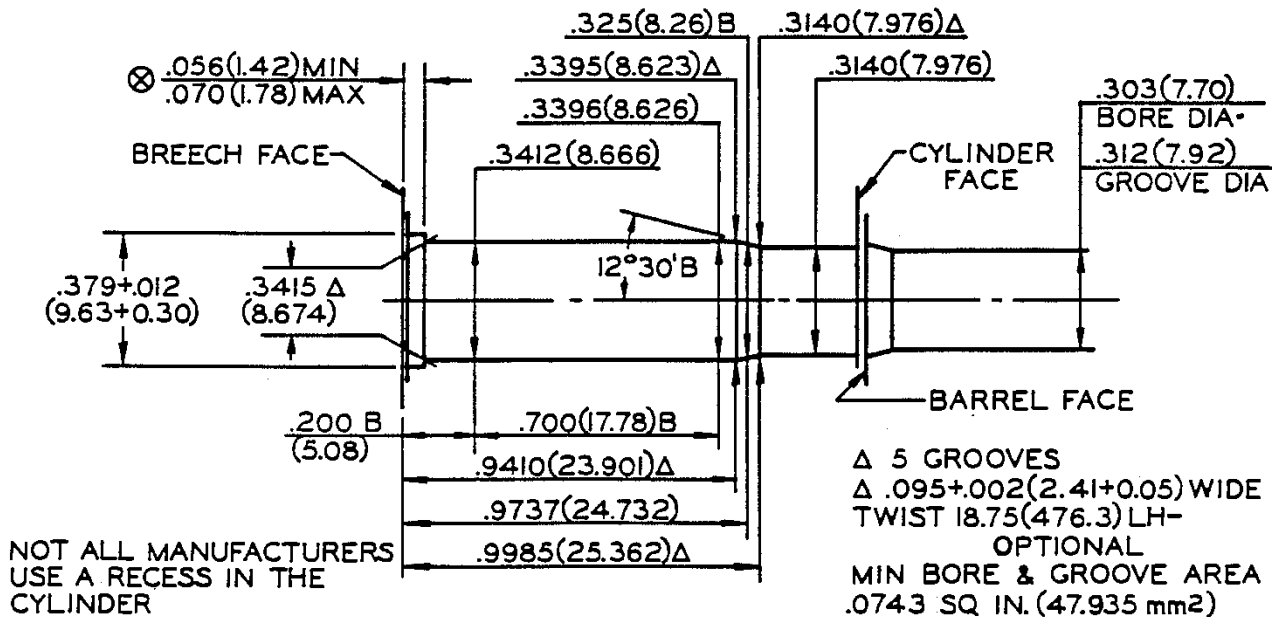
Technical drawing of a Smith & Wesson Long Colt New Police bullet. The drawing shows a side view of the bullet with various dimensions and tolerances. Key features include a cylindrical body, a bullet tip, and a rim. Dimensions are given in inches and millimeters. The drawing is labeled "SMITH & WESSON LONG" and "COLT NEW POLICE".

Dimensions and Tolerances:

- Top Rim:  $.055-.010$  (1.40-0.25)
- Second Rim:  $.040-.010$  (1.02-0.25)
- Body Diameter:  $.337(8.56)$  CYLINDRICAL
- Tip Diameter:  $.3150-.0060$  (8.001-0.152)
- Tip Shape: BULLET
- Tip Angle:  $35^{\circ} \pm 20^{\circ}$
- Rim Thickness:  $.375-.012$  (9.53-0.30)
- Rim Diameter:  $.200 B$  (5.08)
- Body Length:  $.920-.020$  (23.37-0.51)
- Overall Length:  $1.280(32.51) \text{ MAX}$
- Minimum Length:  $1.230(31.24) \text{ MIN}$
- Minimum Length:  $1.210(30.73) \text{ MIN}$

Notes:

- UNDERCUT AHEAD OF RIM IS OPTIONAL
- SMITH & WESSON LONG
- COLT NEW POLICE



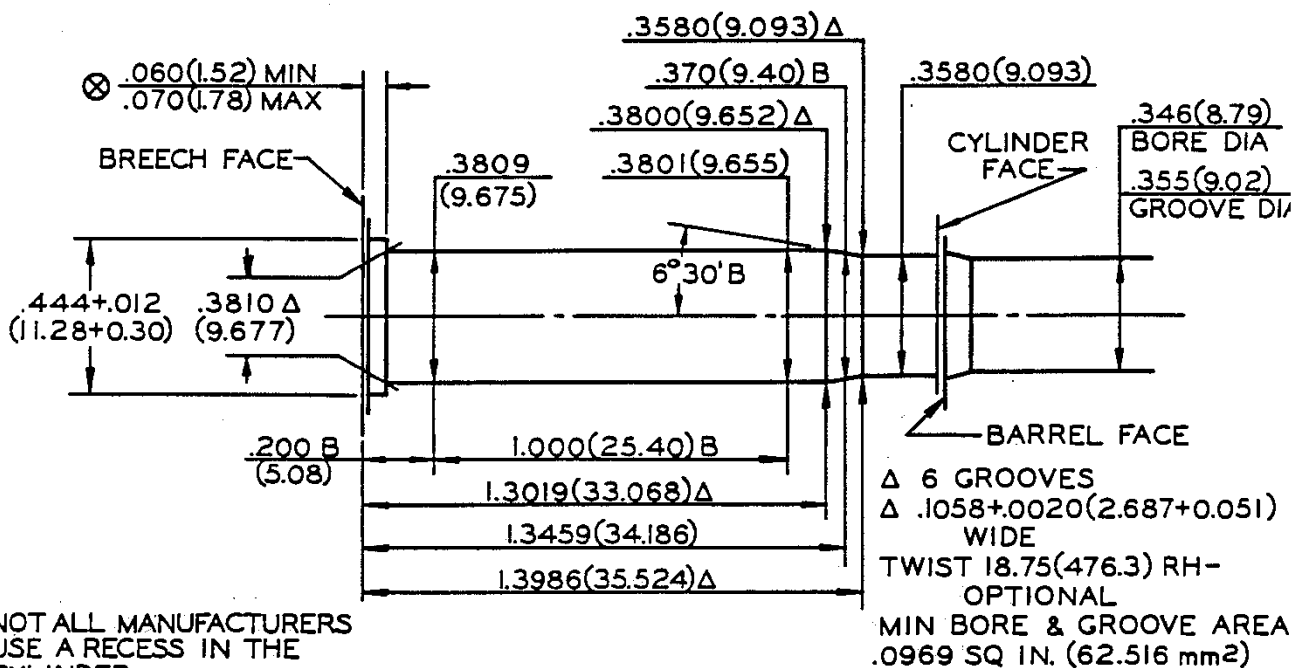
UNLESS OTHERWISE NOTED  
ALL DIA +.004 (Q10)  
LENGTH TOL +.015 (Q38)

B = BASIC  
(XX.XX) = MILLIMETERS  
⊗ = HEADSPACE DIMENSION  
Δ = REFERENCE DIMENSION  
\* DIMENSIONS ARE TO INTERSECTION OF LINES.

34

CARTRIDGE & CHAMBER  
357 MAGNUM

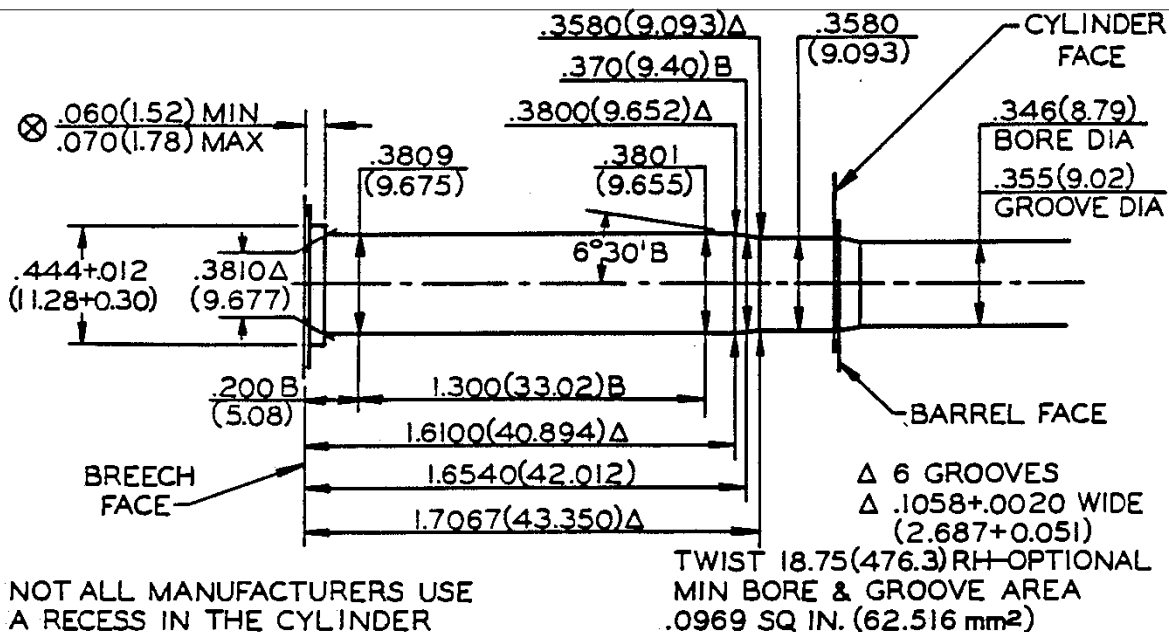
UNLESS OTHERWISE NOTED  
BODY DIA -.006(0.15)



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

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

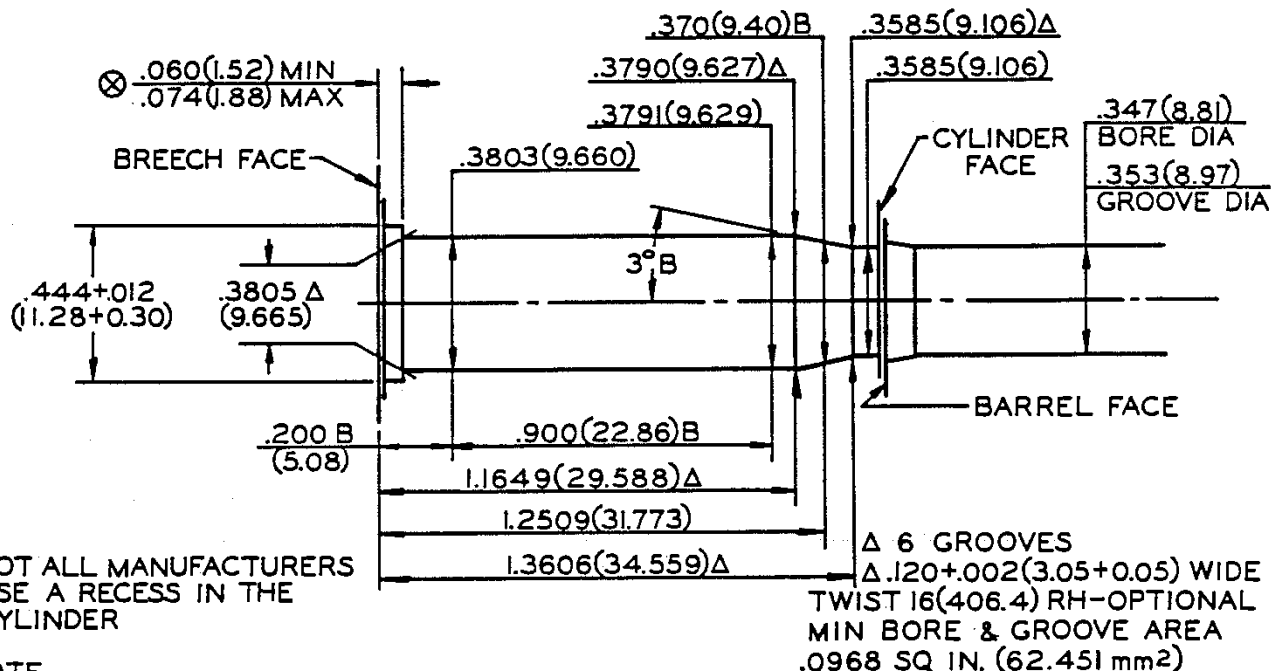
CARTRIDGE & CHAMBER  
357 REMINGTON MAXIMUM



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

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

CARTRIDGE & CHAMBER  
38 LONG COLT

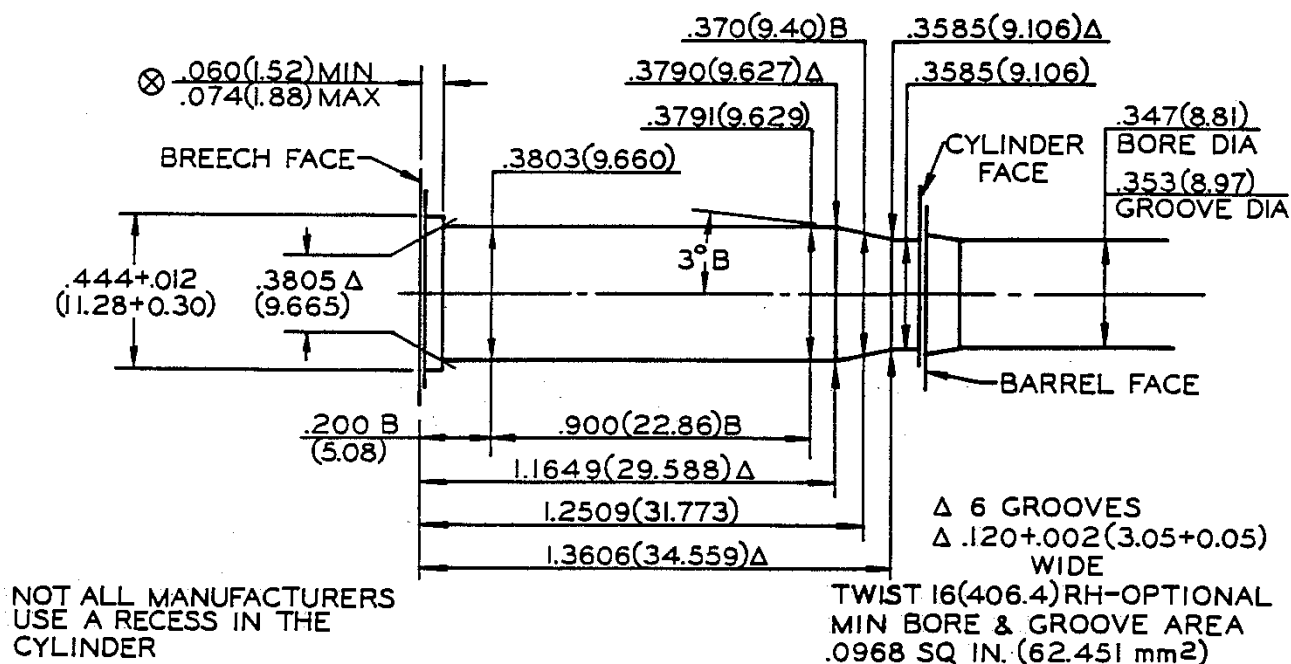
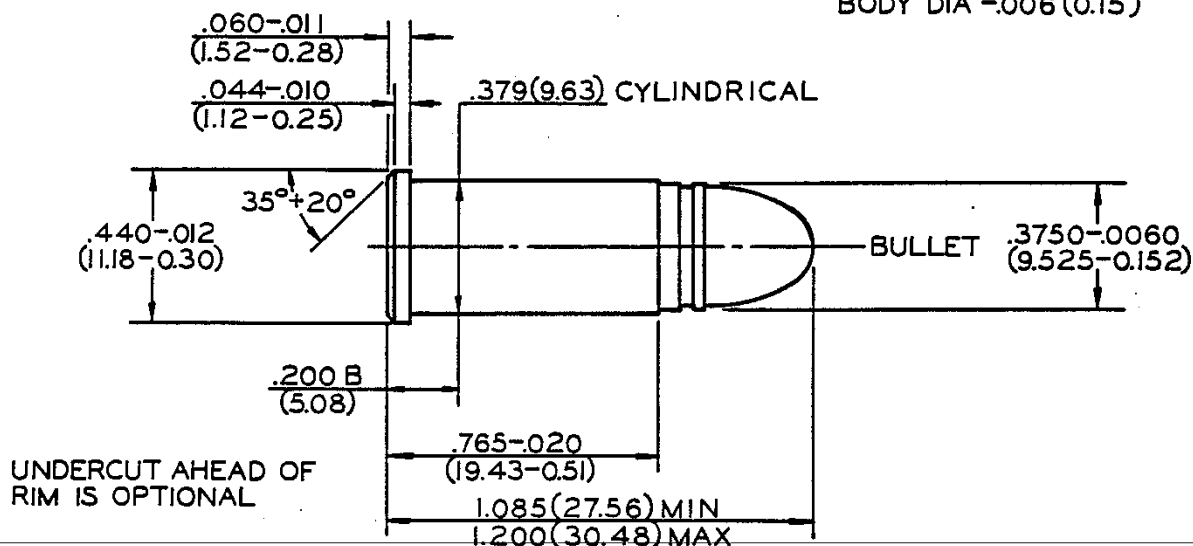


LENGTH TOL +.015(0.38)

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

CARTRIDGE & CHAMBER  
38 SHORT COLT

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



NOTE

B = BASIC

(XX.XX) = MILLIMETERS

⊗ = HEADSPACE DIMENSION

Δ = REFERENCE DIMENSION

\* DIMENSIONS ARE TO INTERSECTION OF LINES

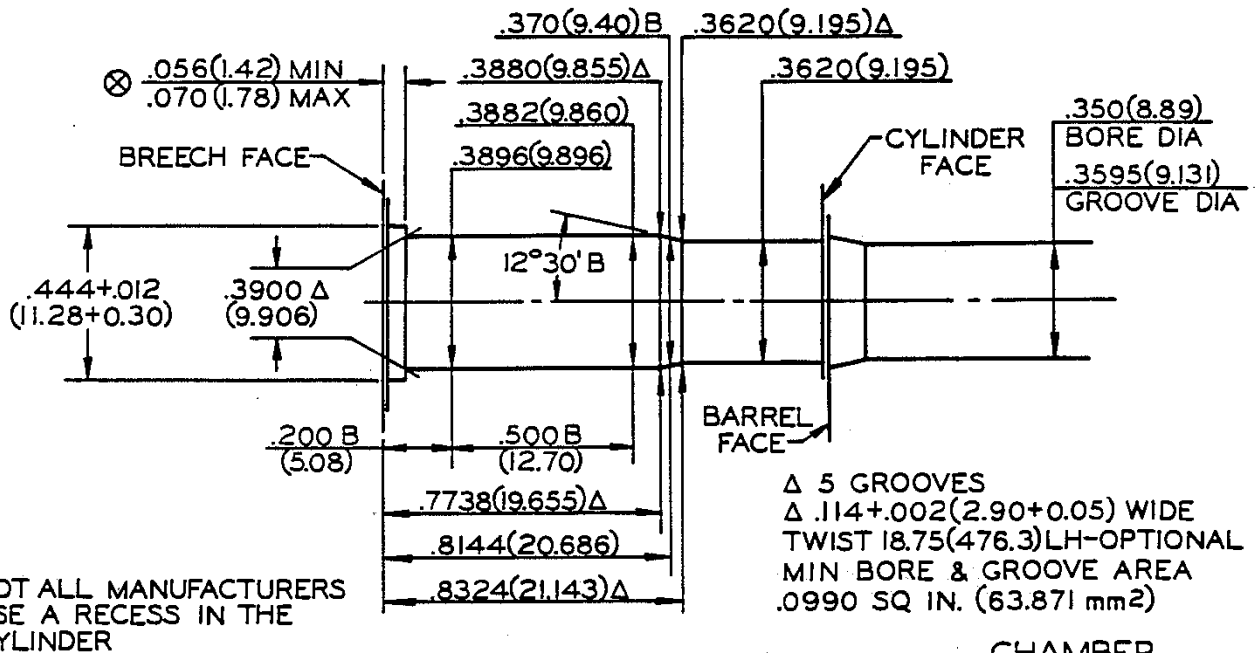
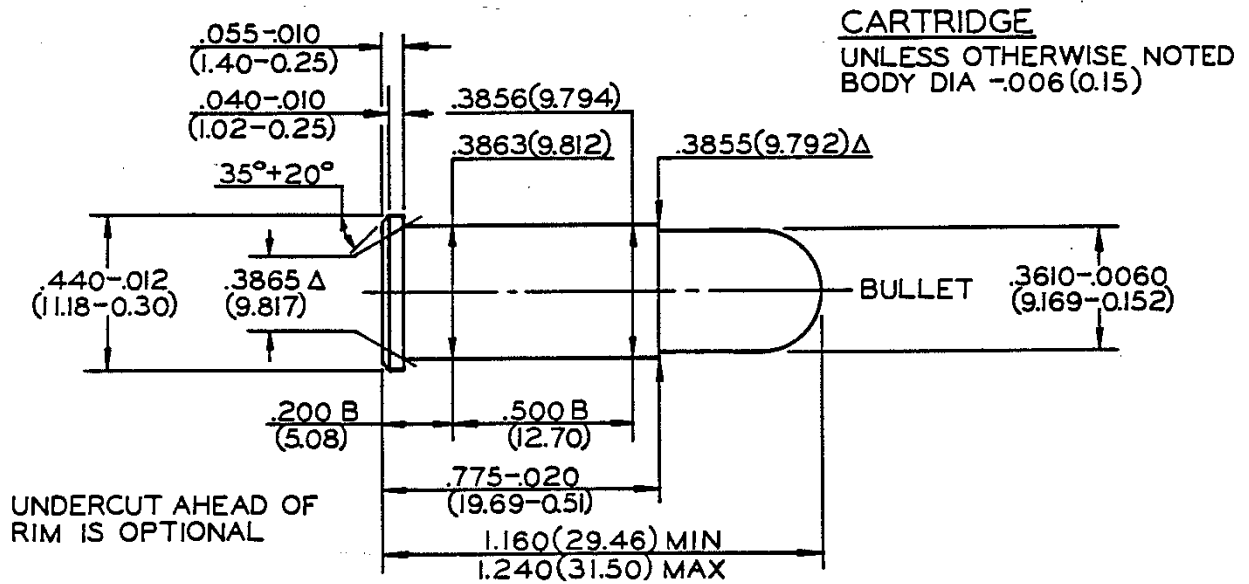
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

CHAMBER

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

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

CARTRIDGE & CHAMBER  
38 SMITH & WESSON  
38 COLT NEW POLICE



**NOTE**

B = BASIC

(XX.XX) = MILLIMETERS

⊗ = HEADSPACE DIMENSION

Δ = REFERENCE DIMENSION

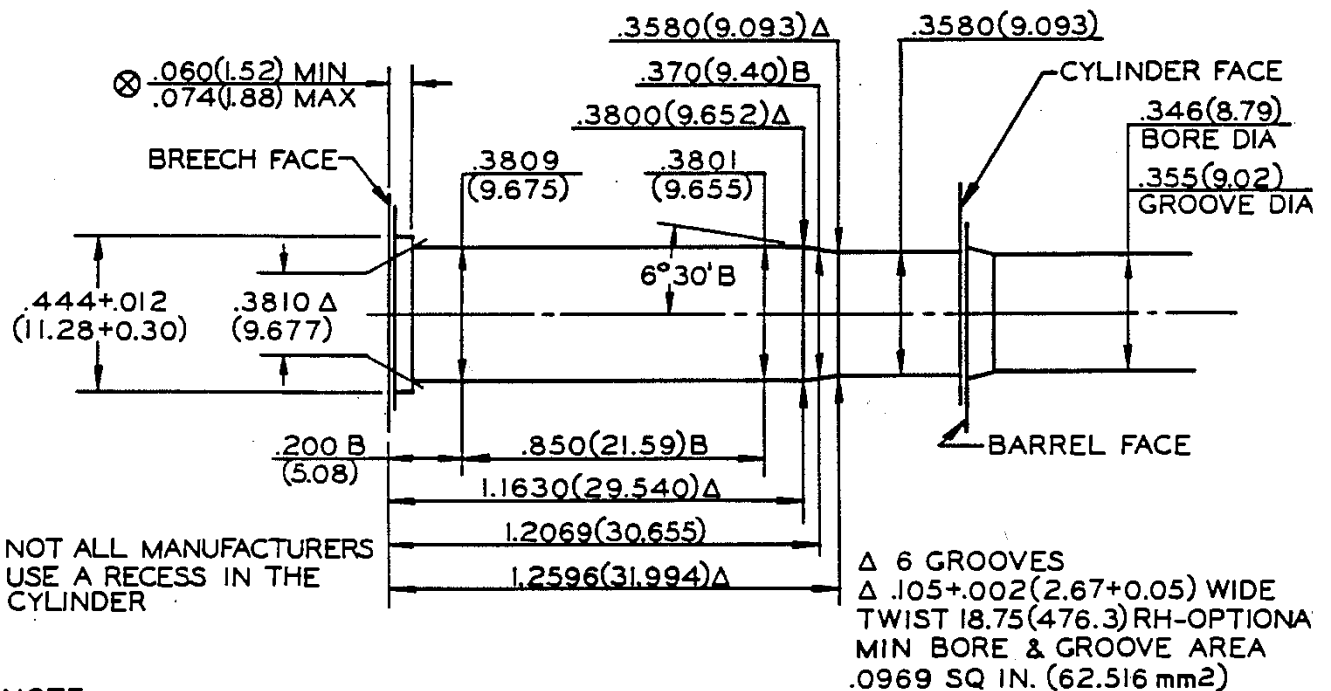
\* DIMENSIONS ARE TO INTERSECTION OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

**CHAMBER**

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

CARTRIDGE & CHAMBER  
38 SPECIAL  
38 SPECIAL +P

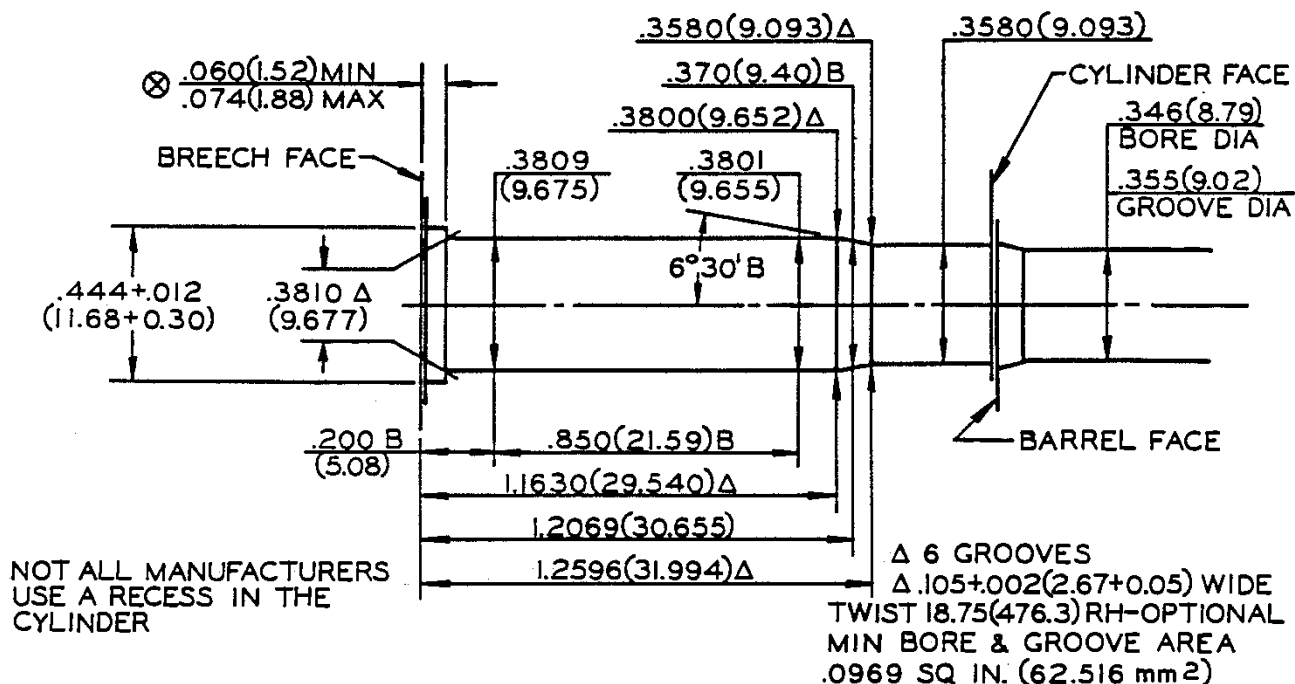
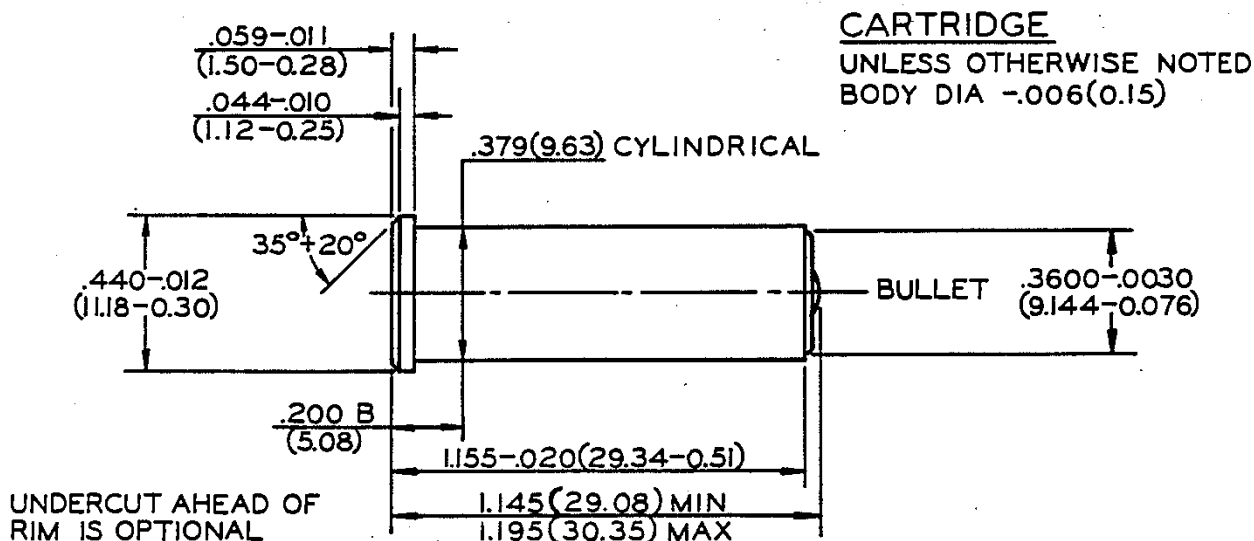


UNLESS OTHERWISE NOTED  
ALL DIA +.004(0.10)  
LENGTH TOL +.015(0.38)



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

CARTRIDGE & CHAMBER  
38 SPECIAL MATCH (REVOLVER)



**NOTE**

B = BASIC

(XX.XX) = MILLIMETERS

⊗ = HEADSPACE DIMENSION

Δ = REFERENCE DIMENSION

\* DIMENSIONS ARE TO INTERSECTION OF LINES.

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

**CHAMBER**

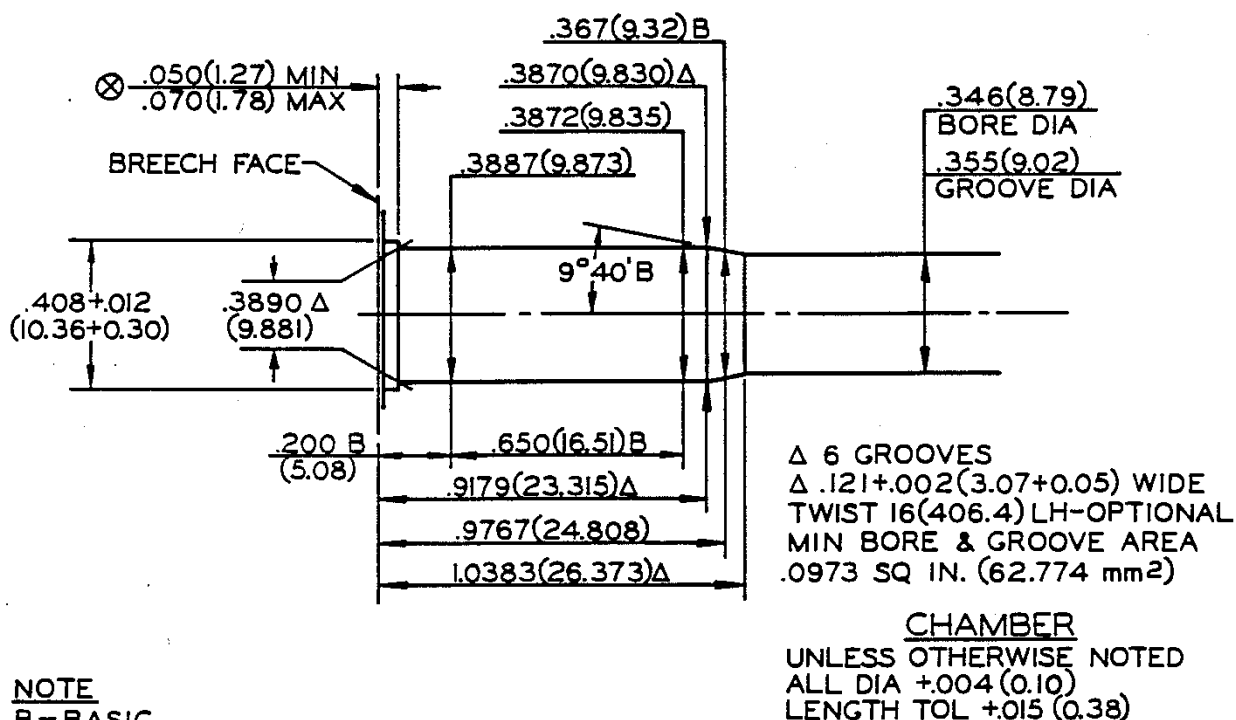
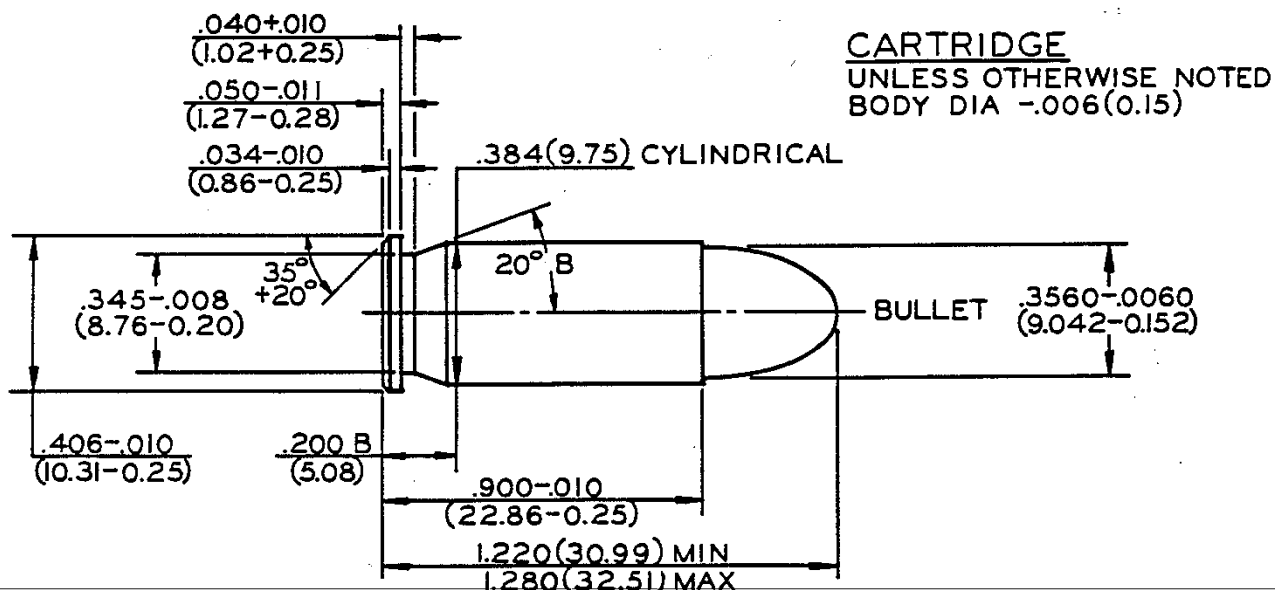
UNLESS OTHERWISE NOTED

ALL DIA  $+.004(0.10)$

LENGTH TOL  $+.015(0.38)$

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

CARTRIDGE & CHAMBER  
38 SUPER AUTOMATIC +P  
38 AUTOMATIC



**NOTE**

B=BASIC

(XX.XX)=MILLIMETERS

⊗=HEADSPACE DIMENSION

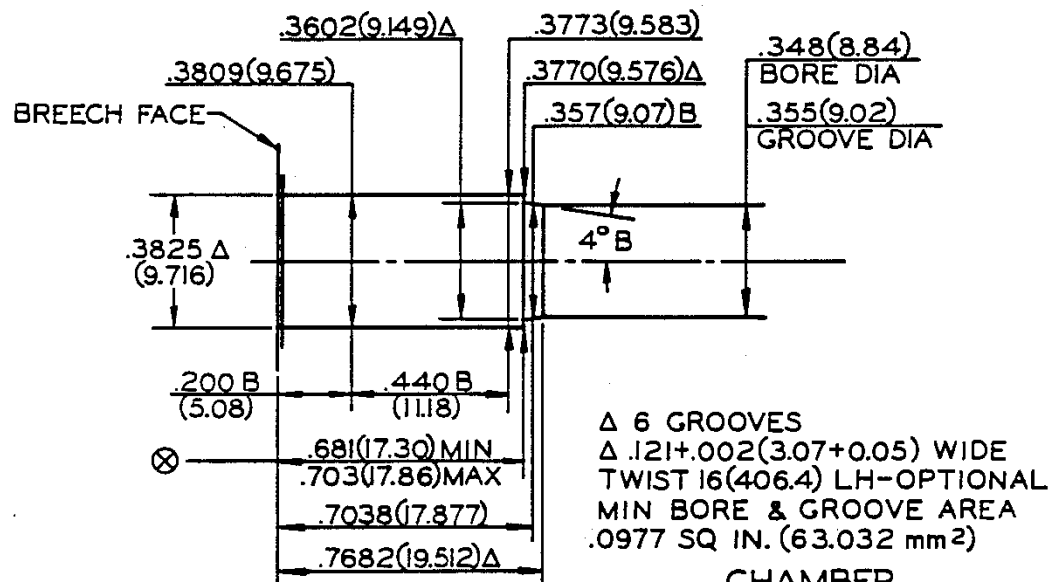
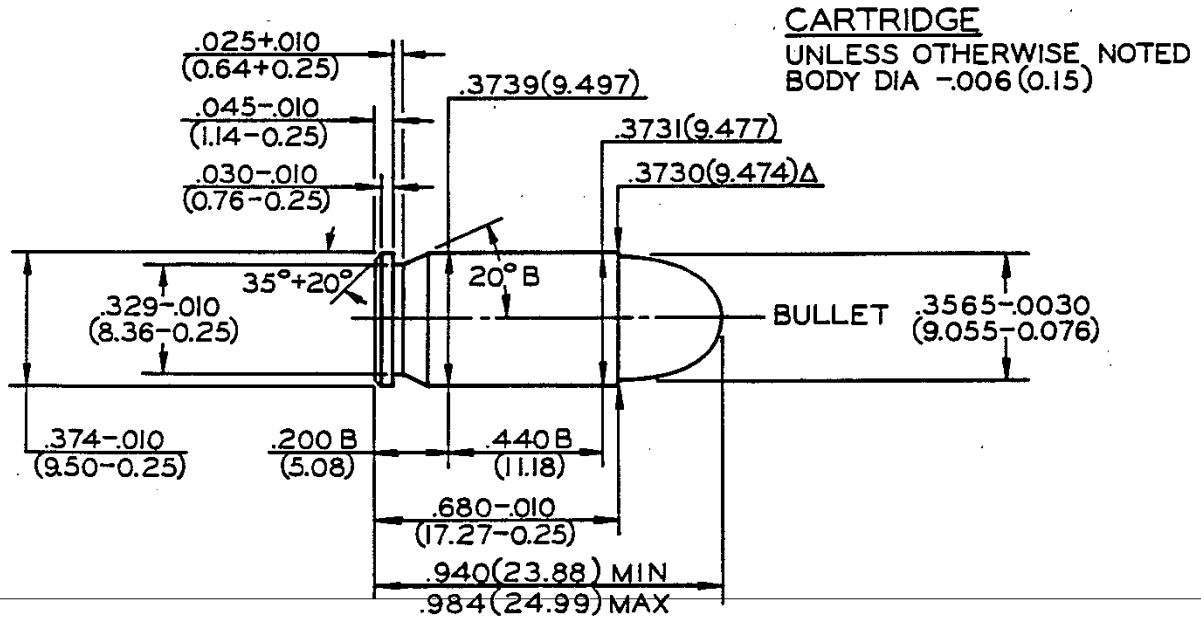
Δ=REFERENCE DIMENSION

\* DIMENSIONS ARE TO INTERSECTION OF LINES

- ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

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

CARTRIDGE & CHAMBER  
380 AUTOMATIC



**NOTE**

B = BASIC

(XX.XX) = MILLIMETERS

⊗ = HEADSPACE DIMENSION

Δ = REFERENCE DIMENSION

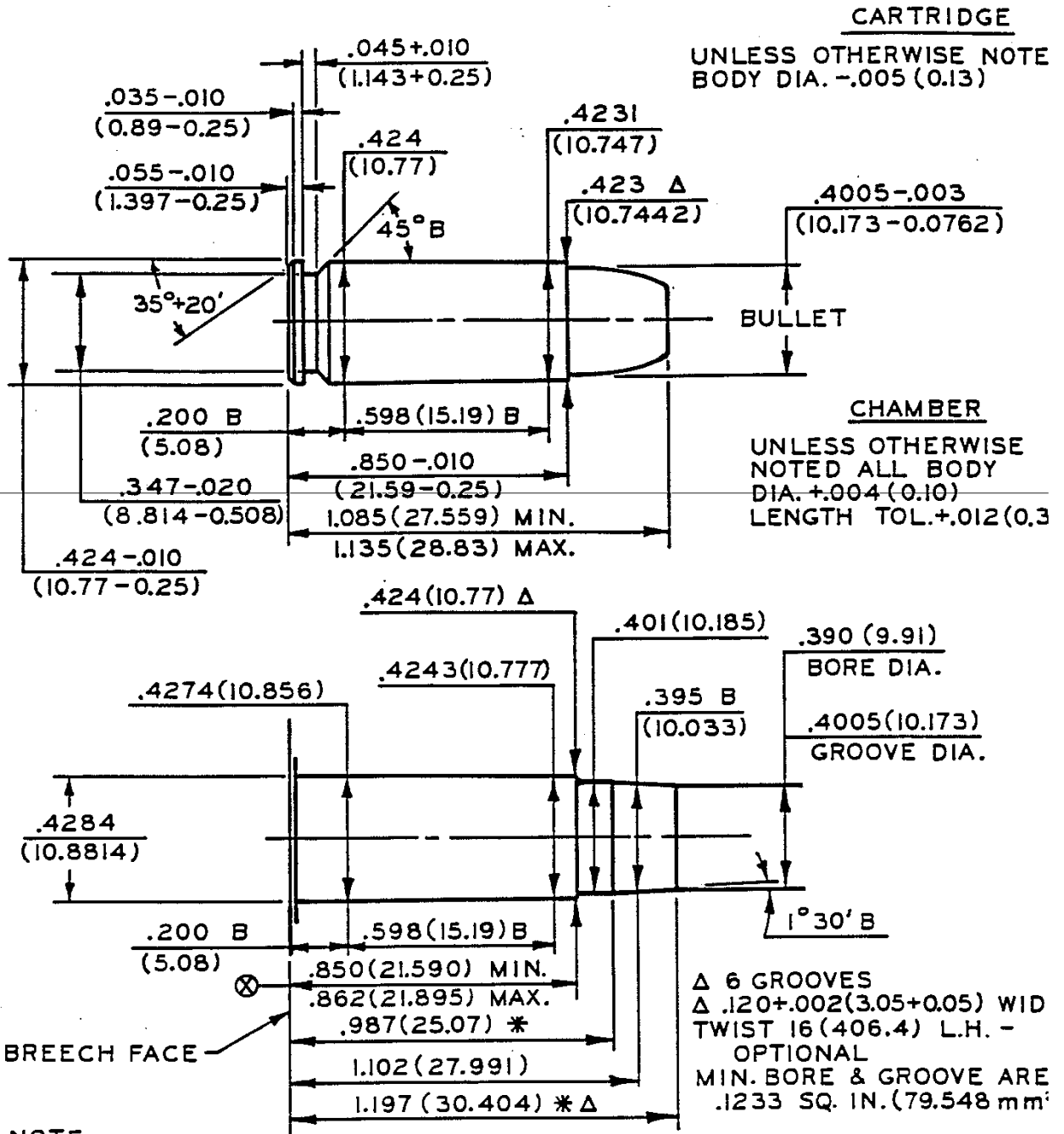
\* DIMENSIONS ARE TO INTERSECTION OF LINES.

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

**CHAMBER**  
UNLESS OTHERWISE NOTED  
ALL DIA  $+.004$  (0.10)  
LENGTH TOL  $+.012$  (0.30)

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

CARTRIDGE & CHAMBER  
 40 SMITH & WESSON

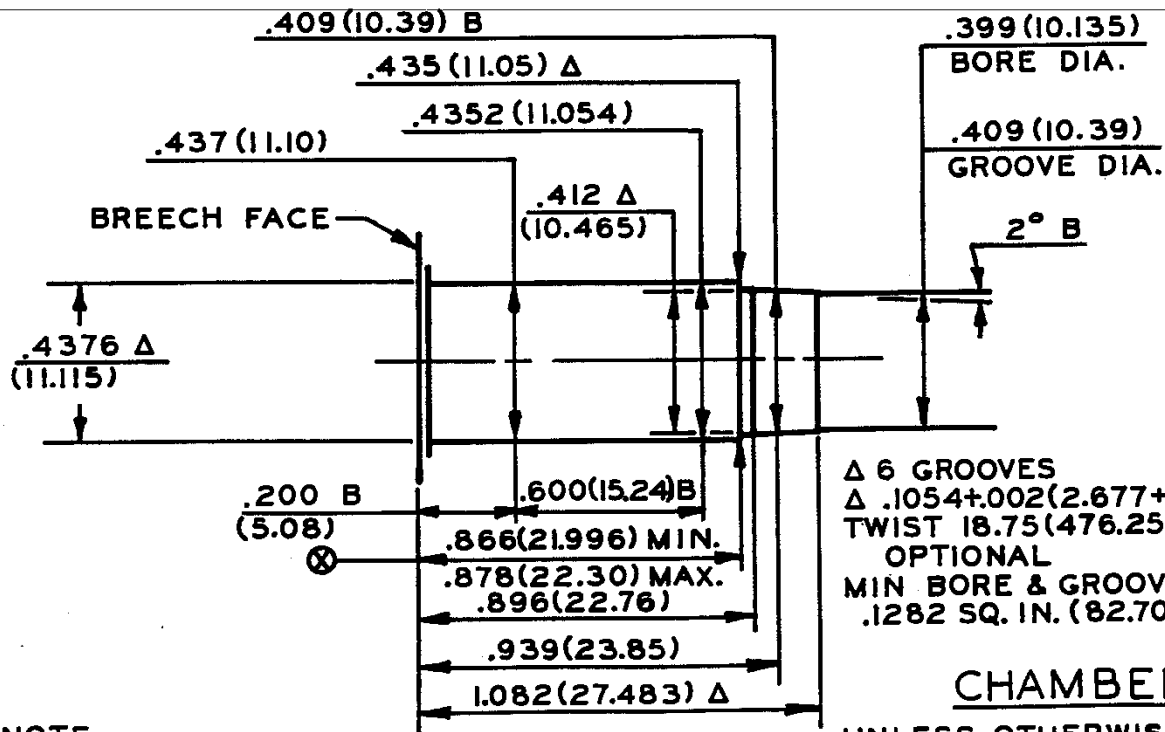
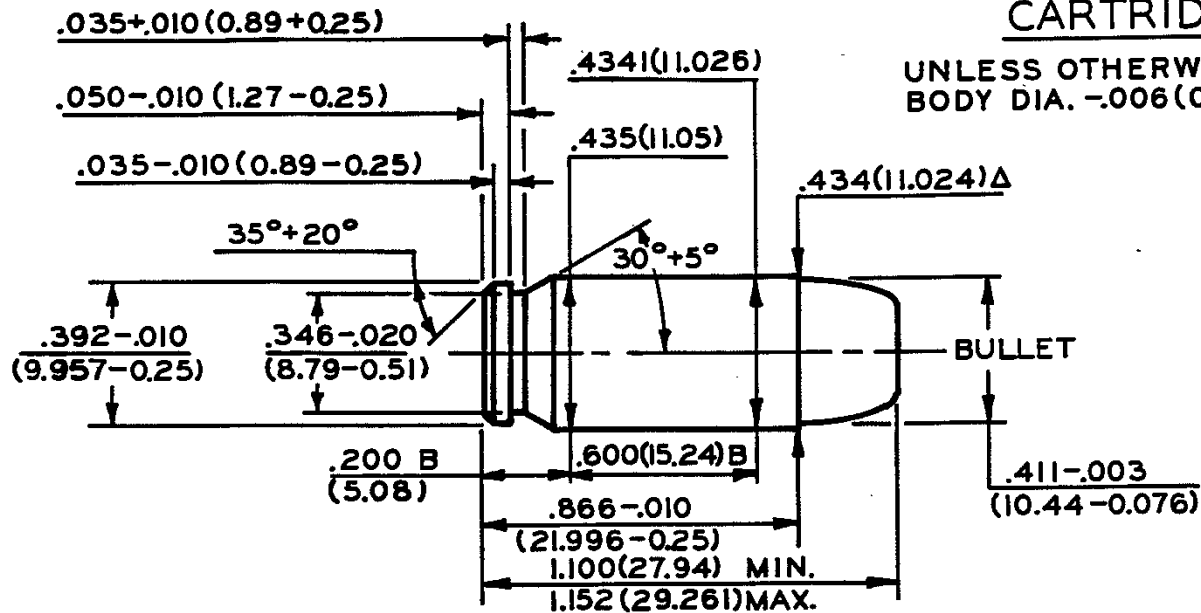


NOTE

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

CARTRIDGE & CHAMBER  
41 ACTION EXPRESS

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



CHAMBER

UNLESS OTHERWISE NOTE  
ALL DIA. +.004 (0.10)  
LENGTH TOL. +.012 (0.30)

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

CARTRIDGE & CHAMBER  
41 REMINGTON MAGNUM



CHAMBER

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

ALL DIA +.004 (0.10)

LENGTH TOL +.015(0.

LENGTH TOL +.015(0.38)

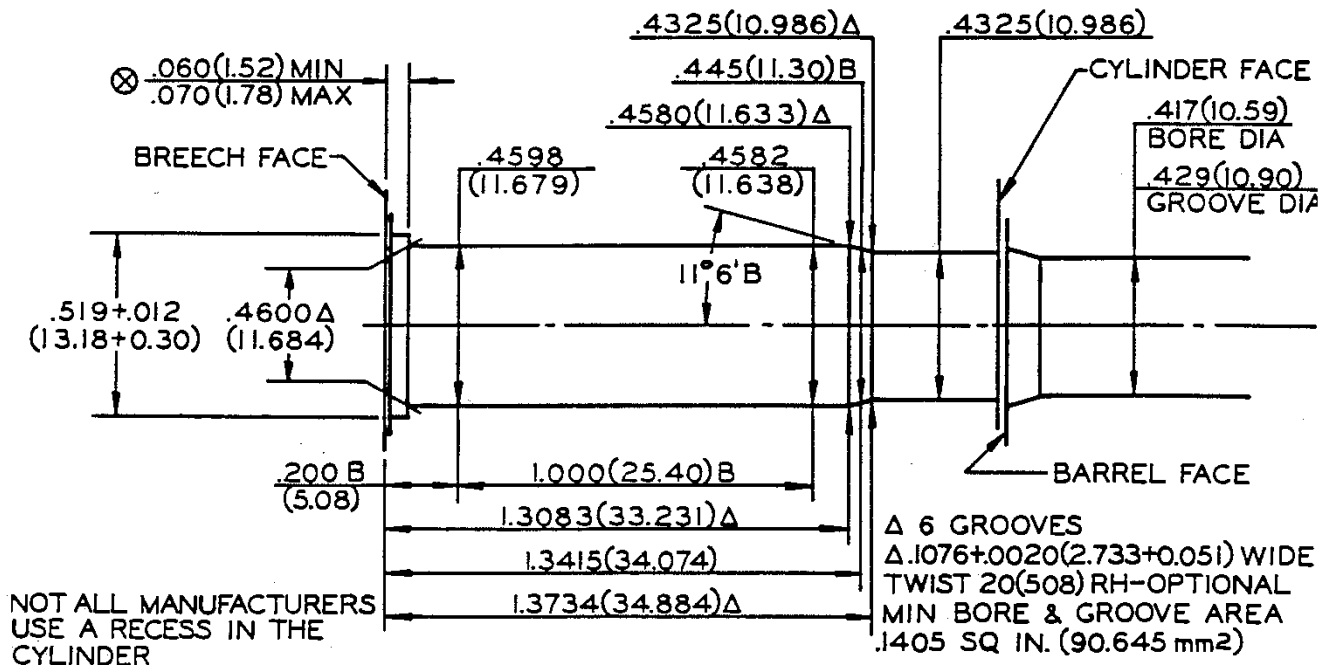
 $\Delta$  = REFERENCE DIMENSION

### 2-REFERENCE DIMENSION CONDITION (MMC)

CARTRIDGE & CHAMBER  
44 REMINGTON MAGNUM

Technical drawing of a .38 S&W bullet showing dimensions and tolerances. The drawing includes the following specifications:

- Body Diameter:** BODY DIA  $-.006$  (0.15)
- Lead:** LEAD  $.4320-.0060$  BULLET (10.973-0.152)
- Dimensions and Tolerances:**
  - Top edge:  $.060-.011$  (1.52-0.28)
  - Top edge:  $.044-.010$  (1.12-0.25)
  - Top edge:  $.4569$  (11.605)
  - Top edge:  $.4561$  (11.585)
  - Top edge:  $.4560 \Delta$  (11.582)
  - Side edge:  $.514-.010$  (13.06-0.25)
  - Side edge:  $.4570 \Delta$  (11.608)
  - Side edge:  $.200 B$  (5.08)
  - Side edge:  $1.000(25.40)B$
  - Side edge:  $1.285-.020(32.64-0.51)$
  - Side edge:  $1.535(38.99) \text{ MIN}$
  - Side edge:  $1.610(40.89) \text{ MAX}$
- Notes:**
  - UNDERCUT AHEAD OF RIM IS OPTIONAL
  - 35°+20° (Angle of the lead)



## CHAMBER

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

ALL DIA  $+0.004$  (0.10)

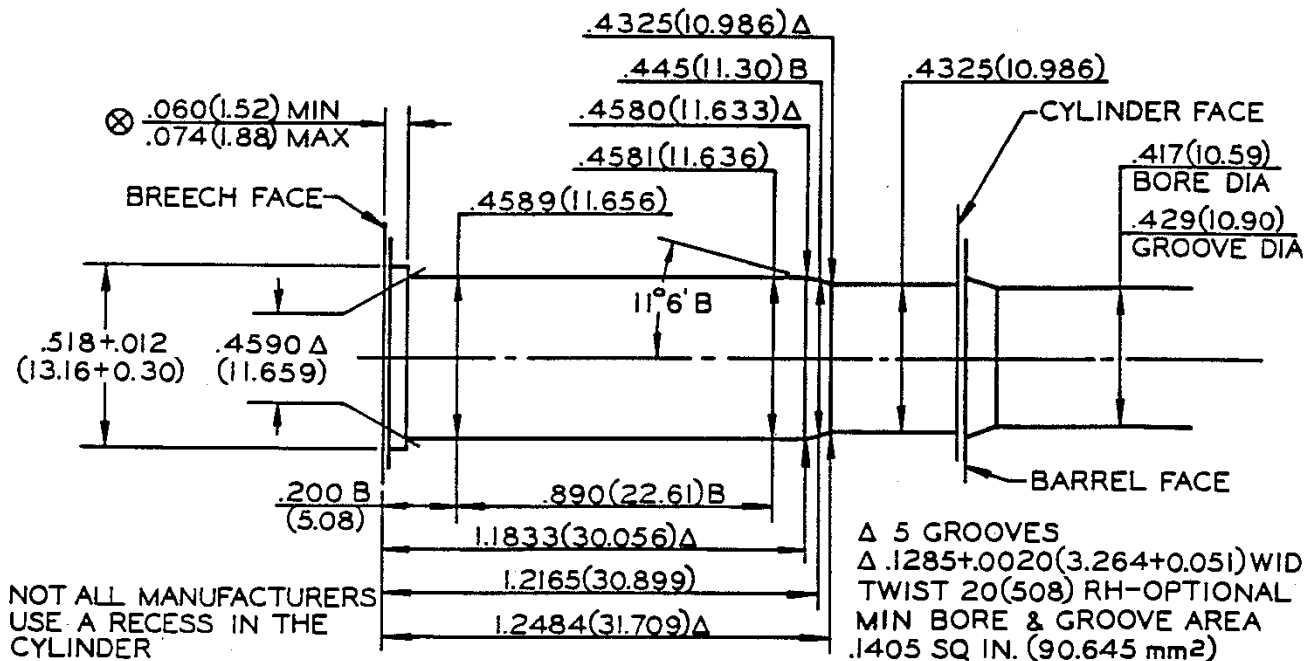
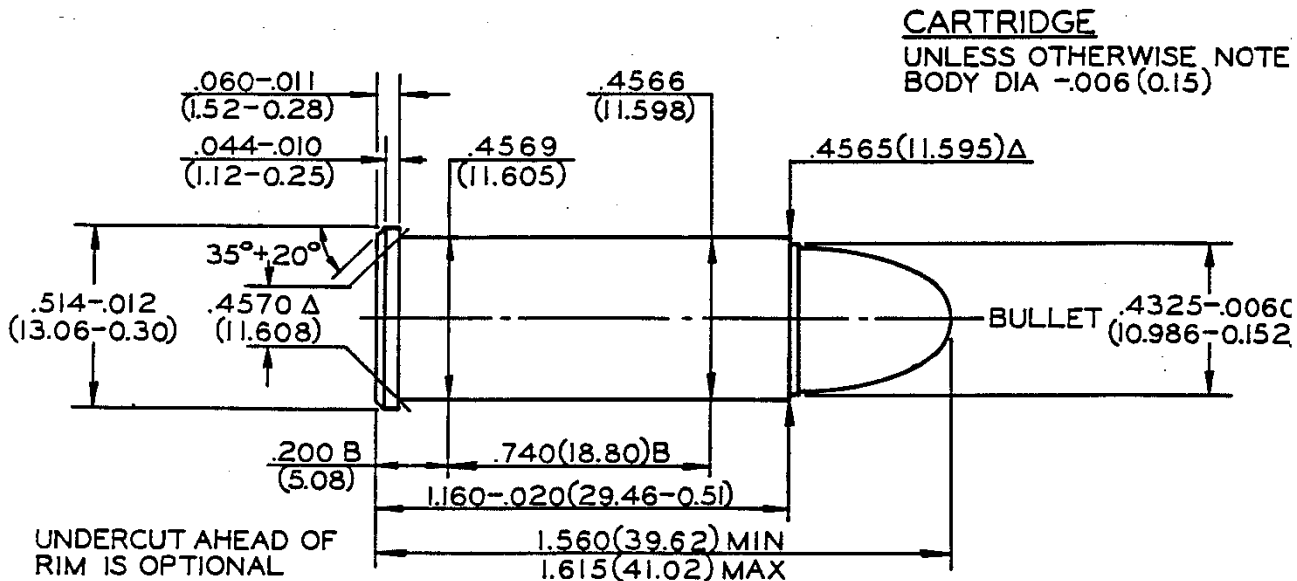
LENGTH TOL +.015(0.38)

LENGTH TOL +.015(0.38)

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

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

CARTRIDGE & CHAMBER  
44 SMITH & WESSON SPECIAL



**NOTE**

B = BASIC

(XX.XX) = MILLIMETERS

⊗ = HEADSPACE DIMENSION

Δ = REFERENCE DIMENSION

\* DIMENSIONS ARE TO INTERSECTION OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

**CHAMBER**

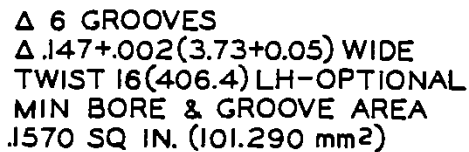
UNLESS OTHERWISE NOTE

ALL DIA  $+.004$  (0.10)

LENGTH TOL  $+.015$  (0.38)



CARTRIDGE & CHAMBER  
45 AUTOMATIC  
45 AUTOMATIC+P



CHAMBER

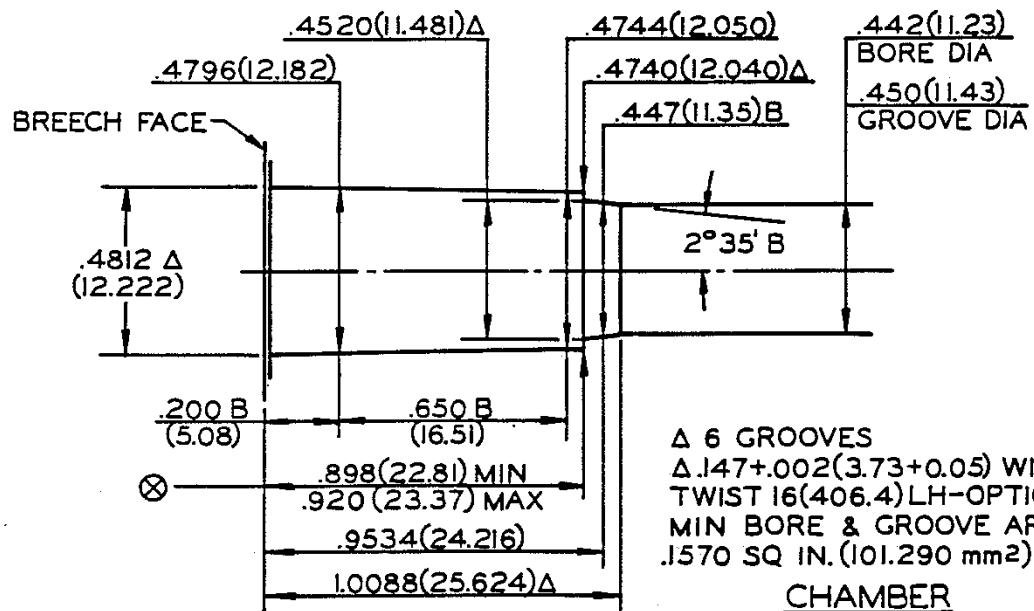
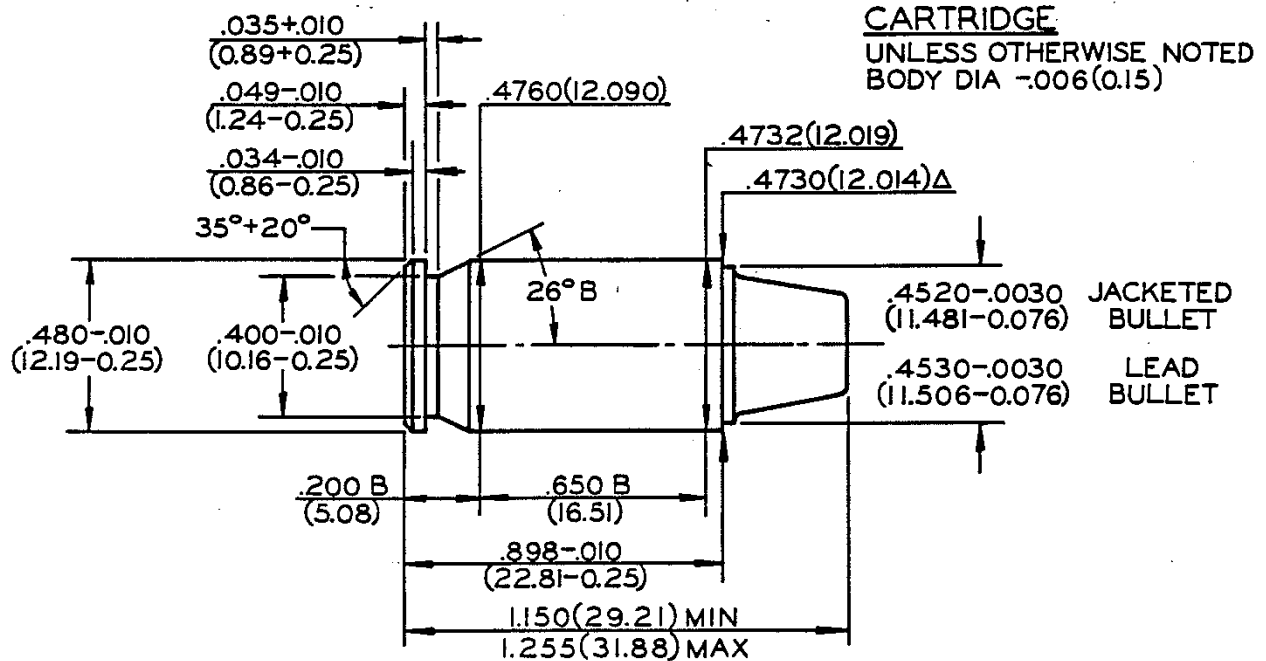
UNLESS OTHERWISE NOTED  
ALL DIA +.004 (0.10)  
LENGTH TOL +.012 (0.30)

LENGTH TOL +.012 (0.30)

LENGTH TOL 4.012 (0.30)

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

CARTRIDGE & CHAMBER  
 45 AUTOMATIC MATCH



**NOTE**

B = BASIC

(XX.XX) = MILLIMETERS

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$\Delta$  = REFERENCE DIMENSION

\* DIMENSIONS ARE TO INTERSECTION OF LINES

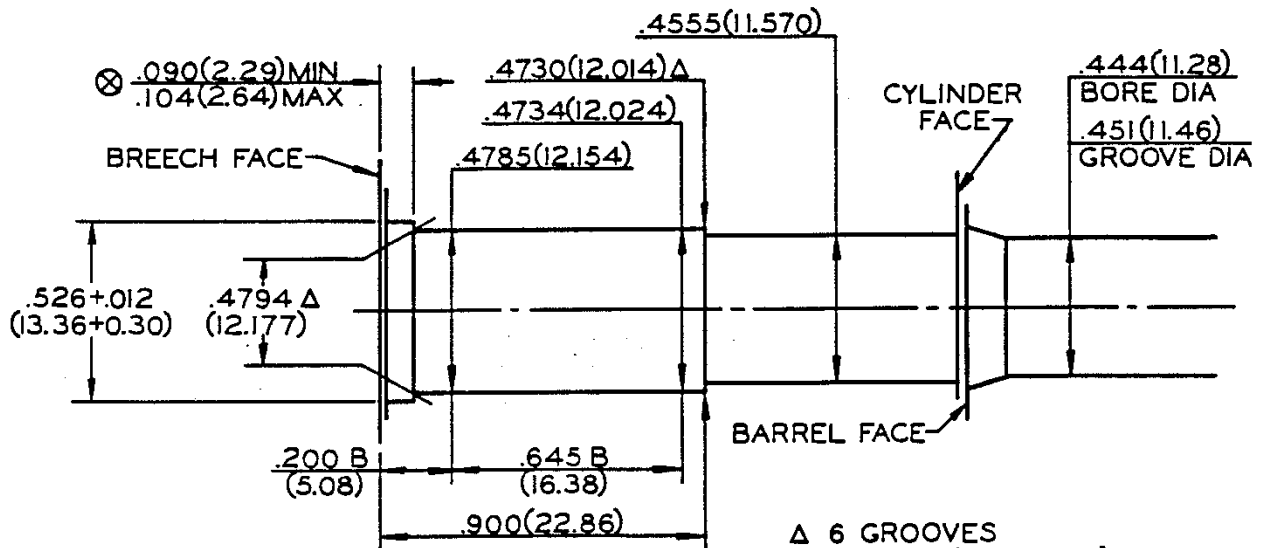
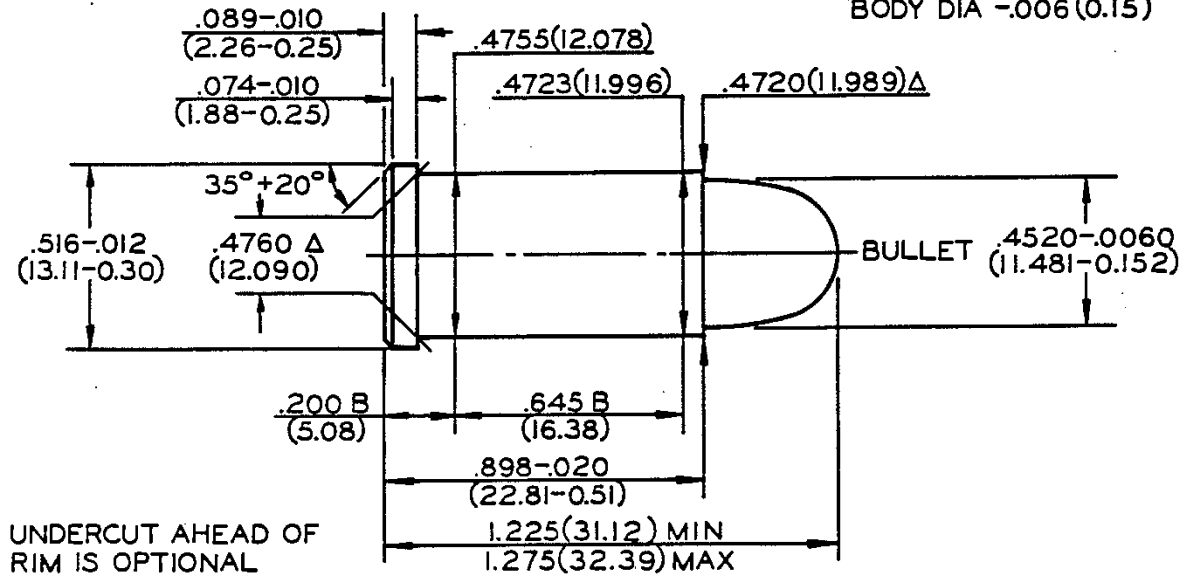
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

**CHAMBER**  
 UNLESS OTHERWISE NOTED  
 ALL DIA  $+.004(0.10)$   
 LENGTH TOL  $+.012(0.30)$

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

CARTRIDGE & CHAMBER  
45 AUTO RIM

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



Δ 6 GROOVES  
Δ .156+.002(3.96+0.05) WIDE  
TWIST 16(406.4) LH-OPTIONAL  
MIN BORE & GROOVE AREA  
.1582 SQ IN. (102.064 mm<sup>2</sup>)

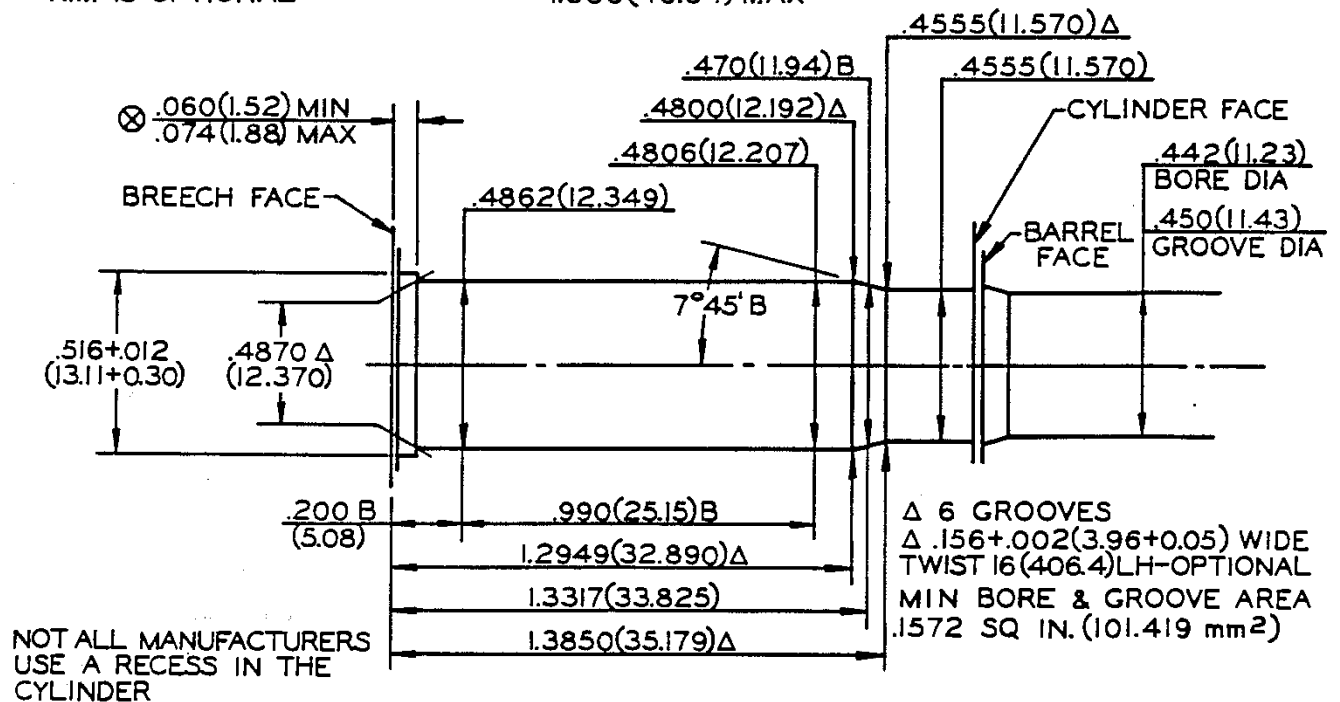
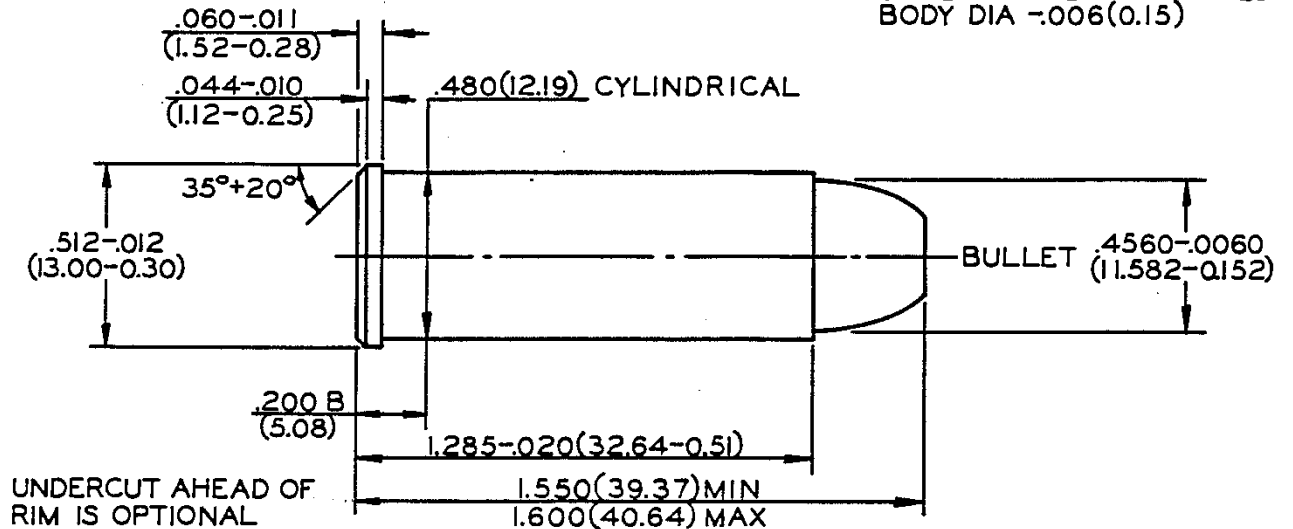
NOTE  
B=BASIC  
(XX.XX)=MILLIMETERS  
⊗=HEADSPACE DIMENSION  
Δ=REFERENCE DIMENSION  
\* DIMENSIONS ARE TO INTERSECTION OF LINES.  
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

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

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

CARTRIDGE & CHAMBER  
45 COLT

CARTRIDGE  
UNLESS OTHERWISE NOTED  
BODY DIA  $\pm .006(0.15)$

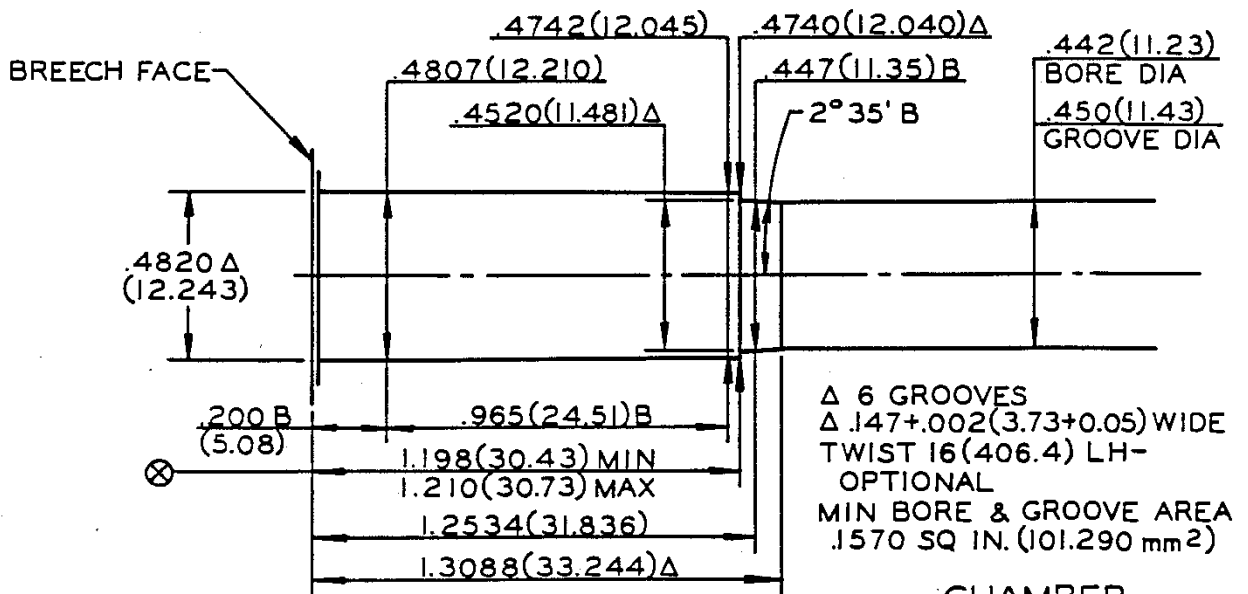
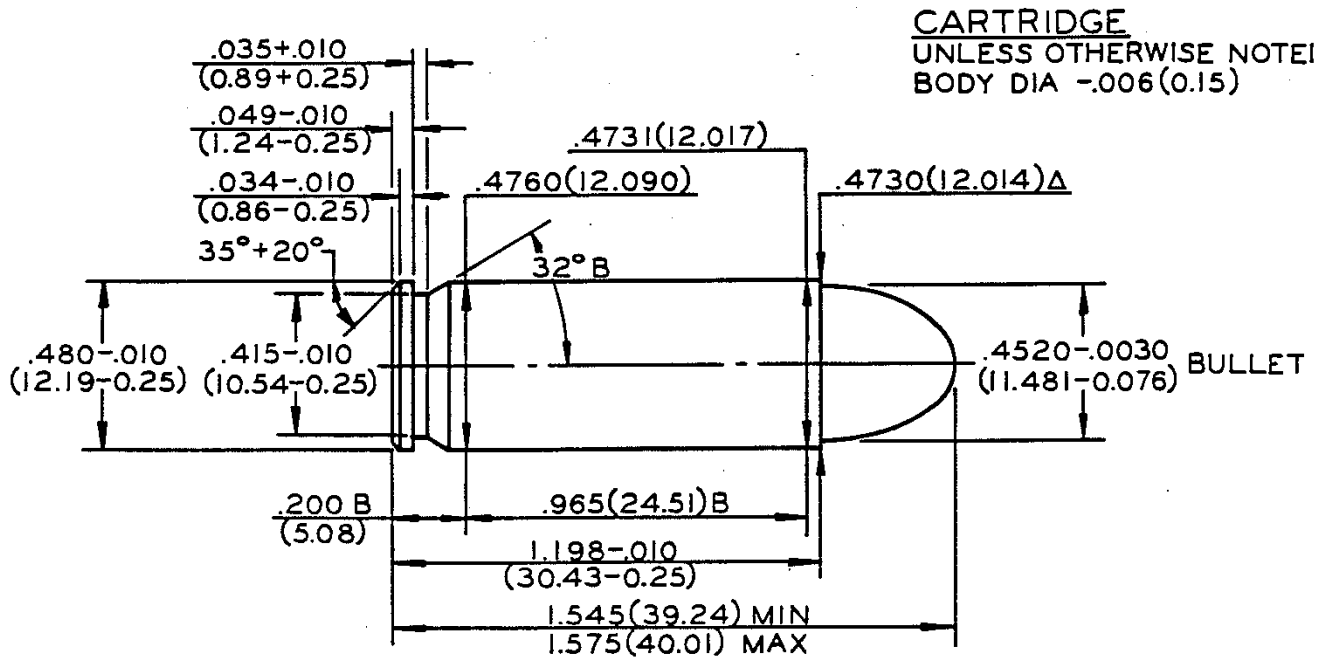


NOTE  
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⊗ = HEADSPACE DIMENSION  
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\* DIMENSIONS ARE TO INTERSECTION OF LINES  
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

CHAMBER  
UNLESS OTHERWISE NOTED  
ALL DIA  $\pm .004(0.10)$   
LENGTH TOL  $\pm .015(0.38)$

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

CARTRIDGE & CHAMBER  
45 WINCHESTER MAGNUM



CHAMBER  
UNLESS OTHERWISE NOTE  
ALL DIA  $+.004(0.10)$   
LENGTH TOL  $+.012(0.30)$

NOTE

B = BASIC (XX.XX) = MILLIMETERS

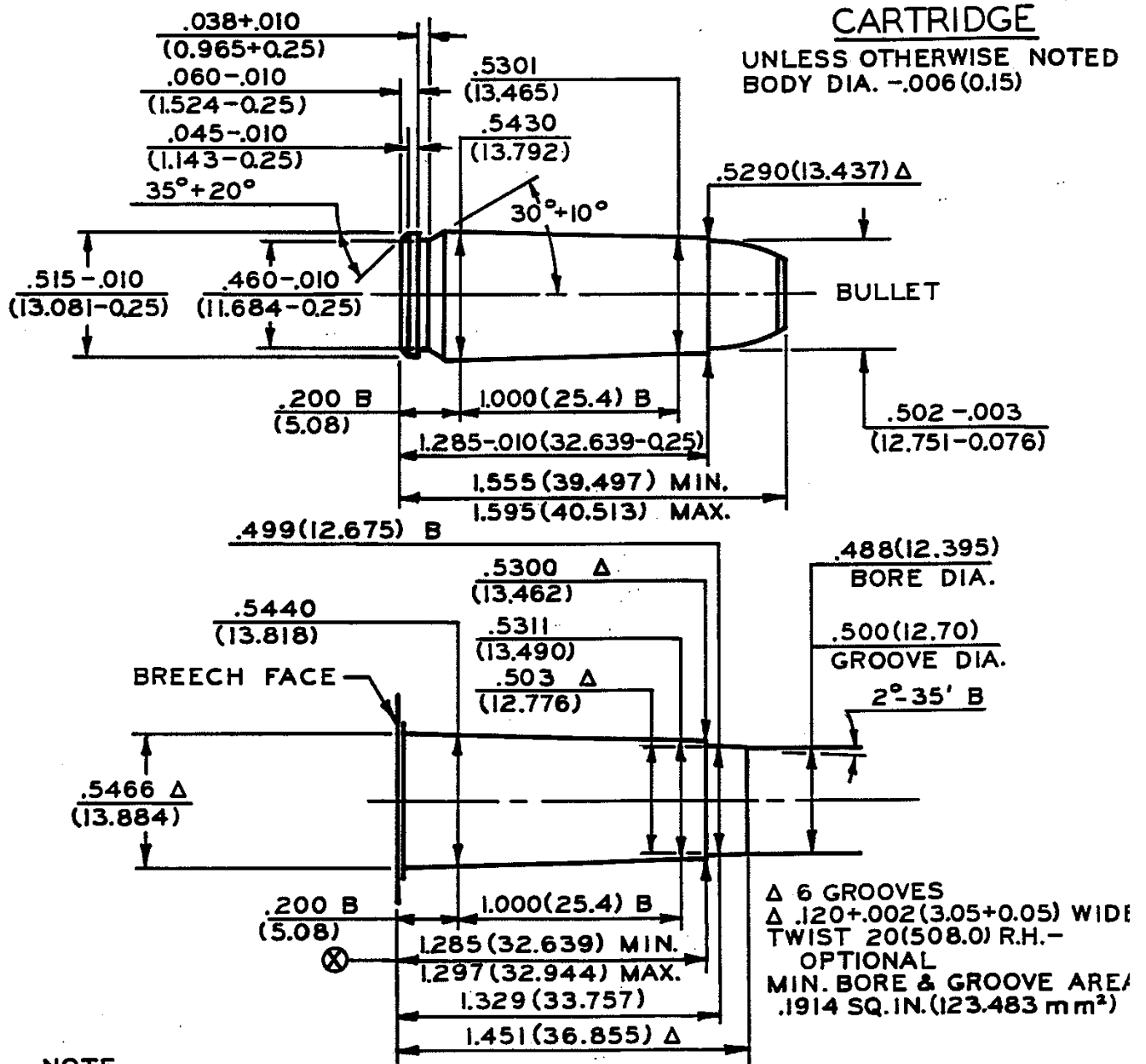
\* DIMENSIONS ARE TO INTERSECTION OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

$\otimes$  = HEADSPACE DIMENSION  
 $\Delta$  = REFERENCE DIMENSION

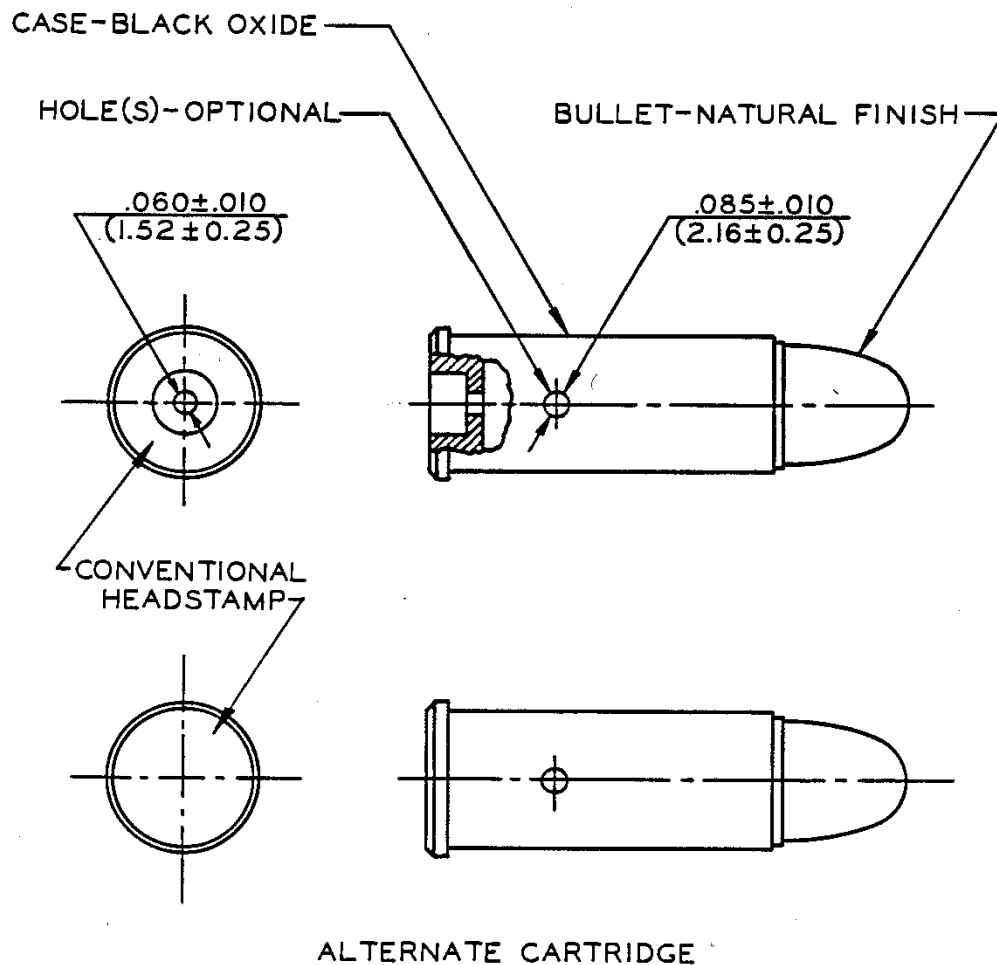
SECTION I - CHARACTERISTICS  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

CARTRIDGE & CHAMBER  
50 ACTION EXPRESS



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

DUMMY CARTRIDGE - GUN FUNCTIONING  
 CENTERFIRE PISTOL & REVOLVER -  
 ALL CALIBERS



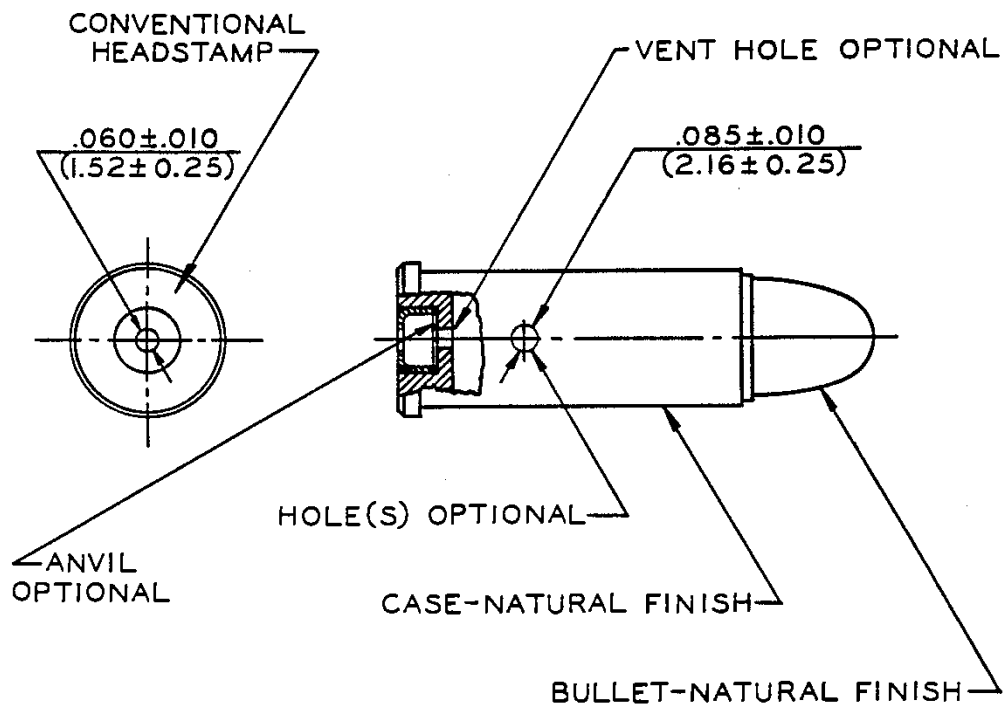
**NOTE**

ILLUSTRATES FORM ONLY-  
 PERTINENT DIMENSIONS SHOWN ON  
 APPROPRIATE CARTRIDGE DRAWING

(XX.XX) = MILLIMETERS

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

DUMMY CARTRIDGE - DISPLAY  
 CENTERFIRE PISTOL & REVOLVER -  
 ALL CALIBERS



NOTE  
 ILLUSTRATES FORM ONLY -  
 PERTINENT DIMENSIONS SHOWN ON  
 APPROPRIATE CARTRIDGE DRAWING

(XX.XX) = MILLIMETERS



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

TOLERANCE - BULLET WEIGHT

BULLET WEIGHT TOLERANCE

To 100 grains - Nominal Weight  $\pm 2\%$ .

100 grains & over - Nominal Weight  $\pm 1.5\%$

SECTION II - PROCEDURES  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

VELOCITY AND PRESSURE TESTING  
SERVICE LOADS

1. Velocities and pressures should be measured in horizontally mounted test barrels of the appropriate caliber and length for the cartridges to be tested.
2. Recommended values for velocity and pressure of all centerfire pistol and revolver cartridges are tabulated in Section I. When required, a minimal retest of double the original quantity may be fired with statistically equivalent tolerances.
3. Drawings and descriptions of the required equipment are listed in Section III of these Standards.
4. 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 chamber, keeping primer end in 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. Conditioning should be between 60°-80°F (15.6°-26.7°C).

SECTION II - PROCEDURES  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

VELOCITY AND PRESSURE TESTING  
SERVICE LOADS

5. Two 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.
6. Pressure Determination
  - a. 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, 357 Rem Max, 41 Rem Mag, 44 Rem Mag - unfilled gas checks may be used).
  - b. Dip piston shank in SAE30 oil and drain until but one drop remains. Scrape remaining drop from bottom of piston or blot remaining drop on a flannel patch.
  - c. Insert piston in piston hole and seat on gas check manually.
  - d. Insert cartridge to be tested in chamber of standard velocity and pressure barrel in the manner described in paragraph 4 above.
  - e. Center crusher cylinder appropriate for the cartridge to be tested upon the head of the piston. The piston may now be seated fully by the action of the set screw against the cylinder before firing. Both ends of the piston, face of set screw and faces of crusher must be free from oil.
  - f. The breech mechanism should be closed gently.
  - g. 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.
  - h. 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.
  - i. 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 deposit 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.

SECTION II - PROCEDURES  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

VELOCITY AND PRESSURE TESTING  
SERVICE LOADS

7. Velocity Determination

Handling of the ammunition should be in accordance with the instructions in Paragraph 4. The time of flight of the bullet should be measured with a 100 kilohertz (minimum) electronic counter chronograph using photoelectric screens spaced 20 feet (6.10m) apart with the first screen 5 feet (1.52m) and the second 25 feet (7.62m) from the muzzle of the test barrel.

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

8. Recording of Test Results

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

a. Ammunition Data

1. Date of test.
2. Nominal cartridge identification.
3. Cartridge caliber.
4. Bullet weight and type.
5. Powder charge, type, lot number.
6. Priming.
7. Type of lubricant (if any).
8. Code or date of loading.

b. Average Velocity uncorrected.

c. Average pressure uncorrected.

d. Maximum and minimum individual velocity.

e. Maximum and minimum individual pressure.

f. Extremem variation (range) of velocity.

g. Extreme variation (range) of pressure.

h. Other statistical indication of variation (optional).

i. Correction to results from firing Reference Ammunition.

8. Recording of Test Results (continued)

- j. Corrected average velocity (optional).
- k. Corrected average pressure (optional).
- l. Recommended values;
  - 1. Average Velocity.
  - 2. Average Pressure.
  - 3. Velocity and pressure variation.
- m. Test barrel and range data:
  - 1. Barrel length and serial number.
  - 2. Barrel history.
  - 3. Type of chronograph and screens.
- n. Test personnel.

9. Use of Reference Ammunition

a. Purpose

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

On request, the SAAMI Office, P.O. Box 838, Branford, CT, 06405 will supply information on the manufacture of specific Reference Ammunition. The method of identifying Reference Ammunition is shown on page 85.

Request for Reference Ammunition should be addressed to the manufacturer of the specific cartridge.

c. Assessment

Details of the assessment tests are shown in Section II, pages 86-89.

9. Use of Reference Ammunition (continued)

d. Clearing House

Results of assessment tests of Reference Ammunition are tabulated, analyzed and distributed by the SAAMI Office.

e. Corrections

For method of applying corrections to tests of service loads, see Section II, pages 78-80.

f. Calibration

For method of calibrating ranges and equipment, see Section II, pages 86-89.

SECTION II - PROCEDURES  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

QUALIFICATION OF VELOCITY  
AND PRESSURE BARRELS

All barrels are not necessarily suitable for use in determining pressure of 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 or velocity test use:

Fire ten rounds of SAAMI Reference Ammunition following the procedures given on pages 58-62. The average test results should not vary from the assessed value of the Reference Ammunition by more than the Inclusion Limits as reported for that lot. The use of Reference Ammunition is detailed on pages 78-80.

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.

SECTION II - PROCEDURES  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

VELOCITY AND 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" (.08mm) over minimum should be maintained. This may be measured by headspace gages, shim stock or feeler gages, 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.



SECTION II - PROCEDURES  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

PROCEDURE - USE OF  
PISTON HOLE GAGES

Pressure Barrel piston hole size should be checked periodically with piston hole gages 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 gages for each piston hole size (.146" dia., .206" dia.) constitute a set: 1) plug gage, 2) longitudinal gage and, 3) transverse gage. Each gage is double-ended, "go" and "no go". The gages are used as described below:

1. Attempt to insert the appropriate "no go" plug gage into the top of the piston hole.
2. Insert the appropriate "no go" longitudinal gage through the chamber, align it with the bottom of the piston hole, and attempt to insert the gage upward into the hole.
3. Attempt to insert the appropriate "no go" transverse gage into the bottom of the piston hole in the same manner as described above for the longitudinal gage.
4. if the piston hole accepts any of the "no go" gages, 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.

SECTION II - PROCEDURES  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

PROCEDURE FOR USING CONFORMAL TYPE  
TRANSDUCER IN THE MEASUREMENT OF  
CFP&R PEAK PRESSURES

Procedure for using conformal type transducers in the measurement of CFP&R peak pressures.

I TEST EQUIPMENT

A. TRANSDUCER CALIBRATION

<u>ITEM</u>	<u>TYPE</u>	<u>ALTERNATE</u>
1. Digital Voltmeter	Fluke, Model 8110A	or equivalent
2. Charge Amplifier	PCB, Model 462B52	or equivalent
3. Transducer Calibrator (Direct Fluidic- Calibrator)	Pressure Products Industries, Model AOH-101-05361	or equivalent
4. Resistance Meter	Kistler, Model 537	or equivalent
5. Transducer	PCB, Model 117BXX	or equivalent
6. Low Noise Cable	PCB, Model 003A05	or equivalent
7. Calibration Fixture	PCB, Model 090B Series	or equivalent
8. In-Barrel Calibrator	PCB, Model 090F Series	or equivalent

B. FIRING TEST

<u>ITEM</u>	<u>TYPE</u>	<u>ALTERNATE</u>
1. Digital Voltmeter	Digitec, Model 276-3	or equivalent
2. Charge Amplifier	PCB, Model 462B52	or equivalent
3. Peak Detector	PCB, Model 451A07	or equivalent
4. Transducer	PCB, Model 117BXX	or equivalent
5. Low Noise Cable	PCB, Model 003AXX	or equivalent

SECTION II - PROCEDURES  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

PROCEDURES FOR USING CONFORMAL  
TYPE TRANSDUCERS IN THE  
MEASUREMENT OF CFP&R PEAK  
PRESSURES

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II EQUIPMENT PREPARATION

- A. All instruments should be operational and calibrated per manufacturer specification. Establish the transfer function of the charge amplifier (on a selected range) to be used in the transducer calibration.
- B. The transducer calibrator and instruments used to calibrate the charge amplifier, peak detector and digital voltmeter should have a certified calibration traceable to the National Institute of Standards & Technology.
- C. Transducers should be properly maintained per manufacturer recommendations and stored in a desiccator when not in use.
- D. CAUTION: Cable, transducers and instrument connectors should be covered with plastic caps when not in use to prevent contamination.
- E. Measure the internal resistance of the transducer and low noise cable. If the resistance is less than  $10^{12}$  ohms, bake-out transducer and low noise cable as described in step III below, Transducer Initialization. If the resistance is in the  $10^{12}$  to  $10^{14}$  ohm range, proceed to step IV, Transducer Calibration.

III TRANSDUCER INITIALIZATION

- A. Clean transducer and low noise cable connectors using Freon TF or equivalent.
- B. Bake out transducer and low noise cable in a temperature - controlled oven for 24 to 48 hours at 250°F.
- 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.

IV TRANSDUCER CALIBRATION

A. INITIAL SET-UP

1. Allow instrumentation to stabilize for at least thirty minutes.
2. Mount transducer with steel spacer rings into a calibration fixture or test barrel as described in PCB Operating Instruction Manual.
3. Mount dummy primer primed cartridge case into calibration fixture or test barrel and complete fixture assembly as per PCB Instruction Manual.
4. Mount calibration fixture or test barrel with transducer to transducer calibrator.
5. Connect transducer and instrumentation as indicated in Figures 1 and 2.
6. Set charge amplifier range switch to a suitable range and set the time constant switch to long.
7. Set DVM to 1-volt or 10-volt range.
8. Adjust Heise readout indicator to 0 psi with no pressure on hydraulic lines.
9. Reset charge amplifier and DVM to obtain zero volts output.
10. Apply pressure in increments indicated on Page 72. Calibration pressure range should be adequate to cover pressure ranges shown on Page 72. DO NOT exceed recommended manufacturers maximum pressure limit on fixture or barrel calibrator.
11. Record DVM reading after the Heise readout indicator is exactly at desired pressure level.
12. Release pressure slowly and verify that the instrumentation returns to zero.
13. Replace the dummy primer primed cartridge case in calibration adaptor.

IV TRANSDUCER CALIBRATION (Continued)

A. INITIAL SET-UP (Continued)

14. Repeat steps 8 through 13 a minimum of ten times.
15. CAUTION: Always increase pressure to desired level, never decrease pressure to desired level.

B. DATA REDUCTION

1. Calculate the average value for the output voltages recorded at each pressure increment. Multiply these average values by the charge amplifier range transfer function ( $pCb/V$ ) to obtain the transducer charge output ( $Q$ ) at each pressure increment ( $P$ ).
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 in Figure 3. It is recommended that when using this technique, all numbers be carried to the third place.

C. TRANSDUCER RECORDS

1. Date of calibration.
2. History of rounds exposed to test firing.
3. Calibration pressure ( $P$ ), charge amplifier voltage output ( $V$ ), and transducer charge output ( $Q$ ).
4. Charge amplifier range and transfer function.
5. Least square line equation.
6. Pressure offset.
7. Transducer identification.
8. Date of next calibration.

V FIRING TEST

A. PRESSURE BARREL INSTALLATION

1. Refer to the SAAMI recommended piezo pressure transducer installation in a pressure barrel illustrated in Section III.

B. INITIAL SET-UP

1. Connect equipment as shown in Figure 5.
2. Allow instrumentation to stabilize for at least thirty minutes.
3. Inspect the transducer mounting cavity in the pressure barrel to assure that the seal seat is free of dirt and any other foreign matter.
4. 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. With the proper spacer installed in the barrel, install the transducer.
5. Loosen the slotted clamp but do not remove clamp.
6. 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, but do not tighten when transducer bottoms.
7. Now tighten the screw closing slotted clamp.
8. Using an open end wrench, tighten the transducer nut. Approximately five to ten ft. lbs. of torque is sufficient.
9. Inspect chamber to assure that the transducer sensing surface is flush with the surface of the test chamber.

B. INITIAL SET-UP (Cont'd)

10. Set the charge amplifier controls as follows:

Range switch to a position that will allow for maximum test pressures and direct pressure readout on the digital voltmeter; time constant as required, and; sensitivity dial to the value of slope  $m$  obtained from the transducer least square line equation.

11. Select peak meter for AC coupling and positive input.

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

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

C. PROCEDURE

1. Reset all pressure instrumentation and assure that the digital voltmeter (DVM) displays all zero's. Test rounds may now be fired.

2. For each round fired, the pressure reading on the DMV should be recorded and pressure instrumentation reset.

D. PEAK PRESSURE DETERMINATION

1. To determine peak pressures, add or subtract as required, the pressure offset value to the pressure readings obtained in the firing test.

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CENTERFIRE PISTOL & REVOLVER  
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PROCEDURE FOR USING CONFORMAL  
TYPE PIEZOELECTRIC TRANSDUCERS  
IN THE MEASUREMENT OF CFP&R  
PEAK PRESSURES

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

<u>Caliber</u>	<u>Pressure Increments (Kpsi)</u>	<u>Pressure Range (Kpsi)</u>
9mm Luger	5	20-45
10mm Auto	5	20-45
25 Auto	3	18-30
32 Auto	2	14-24
32 H&R Mag	2	14-24
32 S&WL	2	10-18
357 Mag	5	20-45
38 Spl	4	10-30
38 Spl +P	4	10-30
380 Auto	3	15-30
40 S&W	5	20-45
41 AE	5	20-45
41 Rem Mag	5	20-45
44 Rem Mag	5	20-45
44 S&W Spl	2	10-18
45 Auto	5	10-30
45 Colt	2	10-18
50 AE	5	20-45



TRANSDUCER CALIBRATION EQUIPMENT INTERCONNECT  
USING 090B CALIBRATION FIXTURE  
OR  
090F IN-BARREL CALIBRATION FIXTURE

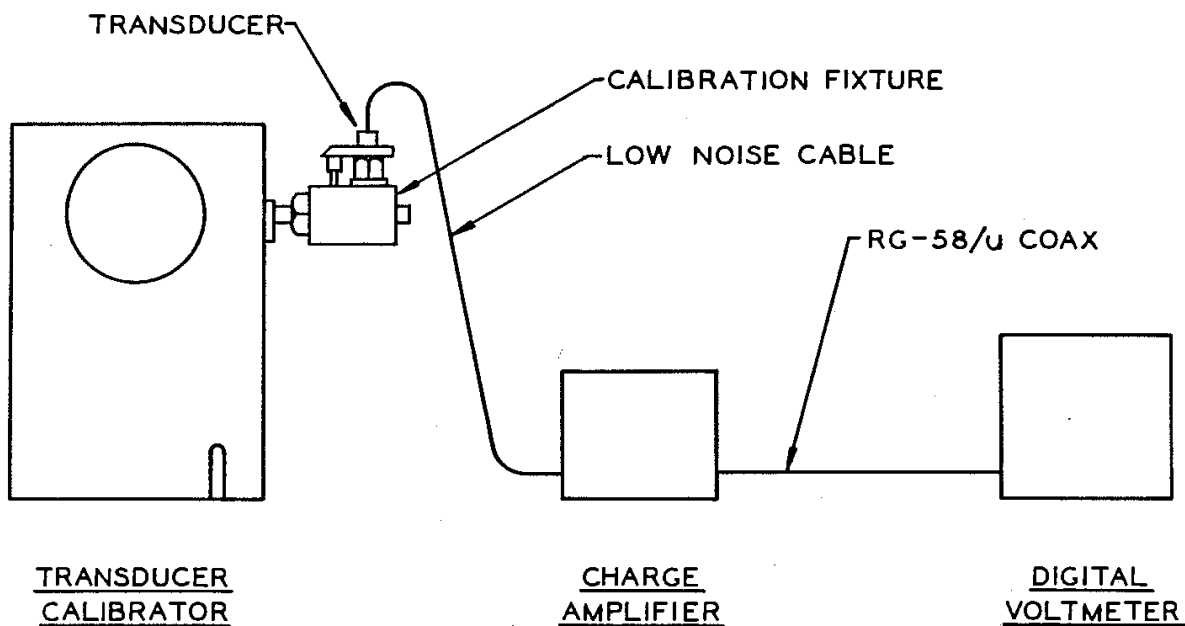


FIGURE 1

TRANSDUCER CALIBRATION EQUIPMENT INTERCONNECT  
 USING IN-BARREL CALIBRATOR

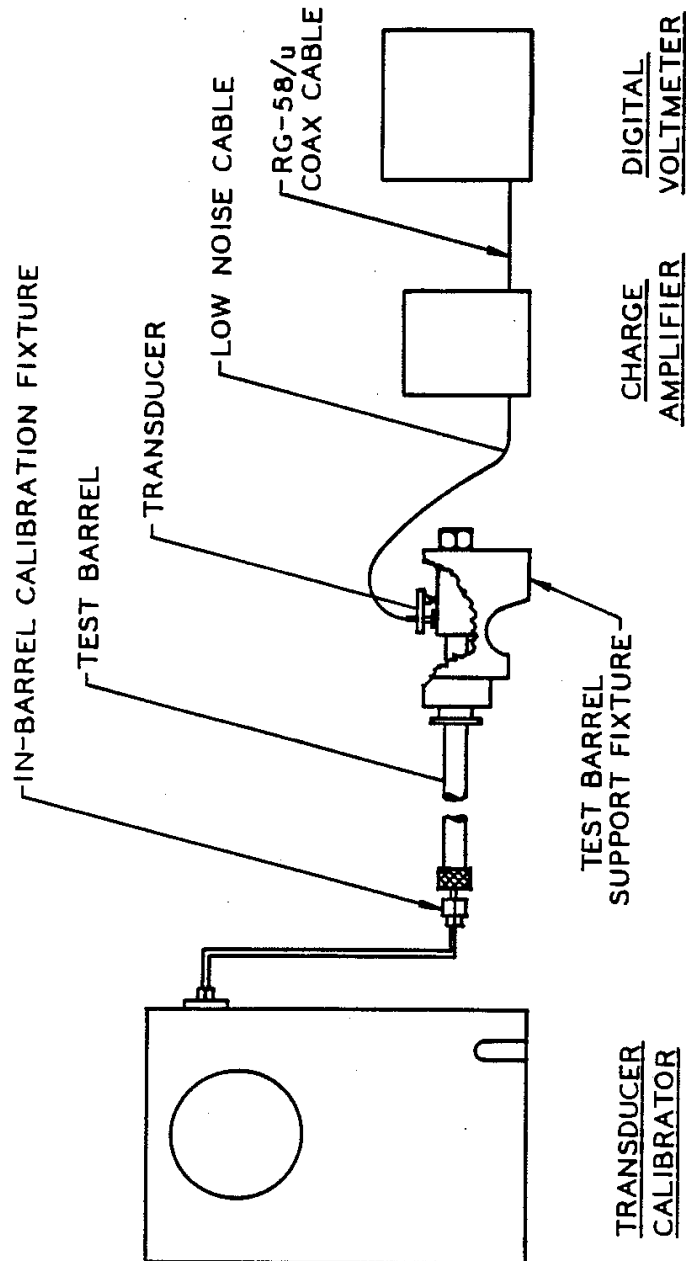


FIGURE 2

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 CENTERFIRE PISTOL & REVOLVER  
 SAAMI VOLUNTARY PERFORMANCE STANDARDS

PROCEDURE FOR USING CONFORMAL TYPE  
 TRANSDUCERS IN THE MEASUREMENT OF  
 CFP&R PEAK PRESSURES

LEAST SQUARE LINE COMPUTATION

$$Q = mP + q$$

where:

Q - Charge in picocoulombs

m - Slope  $\Delta Q/\Delta P$

P - Pressure in pounds per square inch

q - Charge intercept in picocoulombs

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

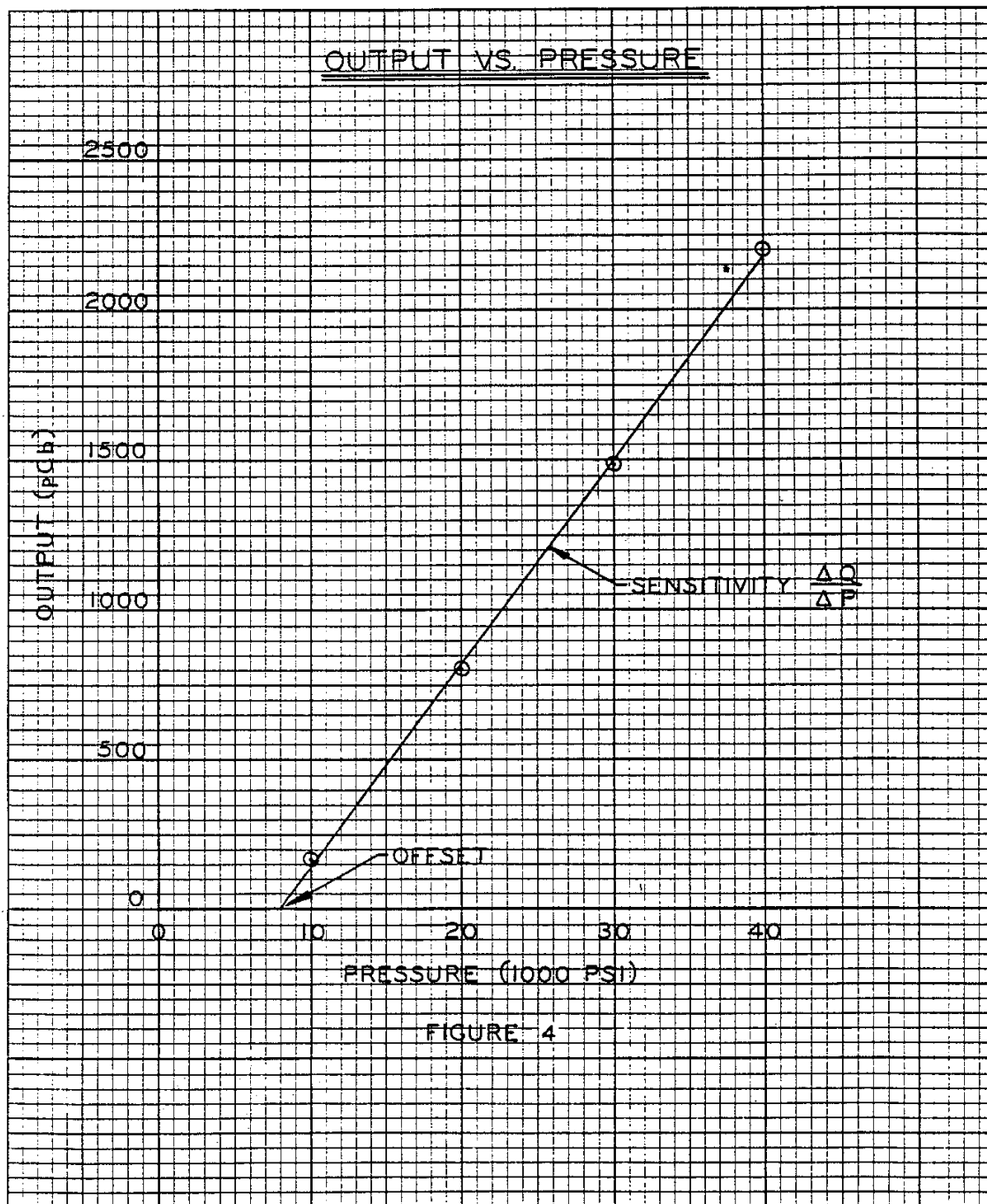
$$q = \frac{\sum P \sum PQ - \sum P^2 \sum Q}{[\sum P]^2 - n \sum P^2}$$

	P	Q	PQ	P <sup>2</sup>
TOTAL				

FIGURE 3

SECTION II - PROCEDURES  
 CENTERFIRE PISTOL & REVOLVER  
 SAAMI VOLUNTARY PERFORMANCE STANDARDS

PROCEDURE FOR USING CONFORMAL TYPE  
 TRANSDUCERS IN THE MEASUREMENT OF  
 CFP&R PEAK PRESSURES



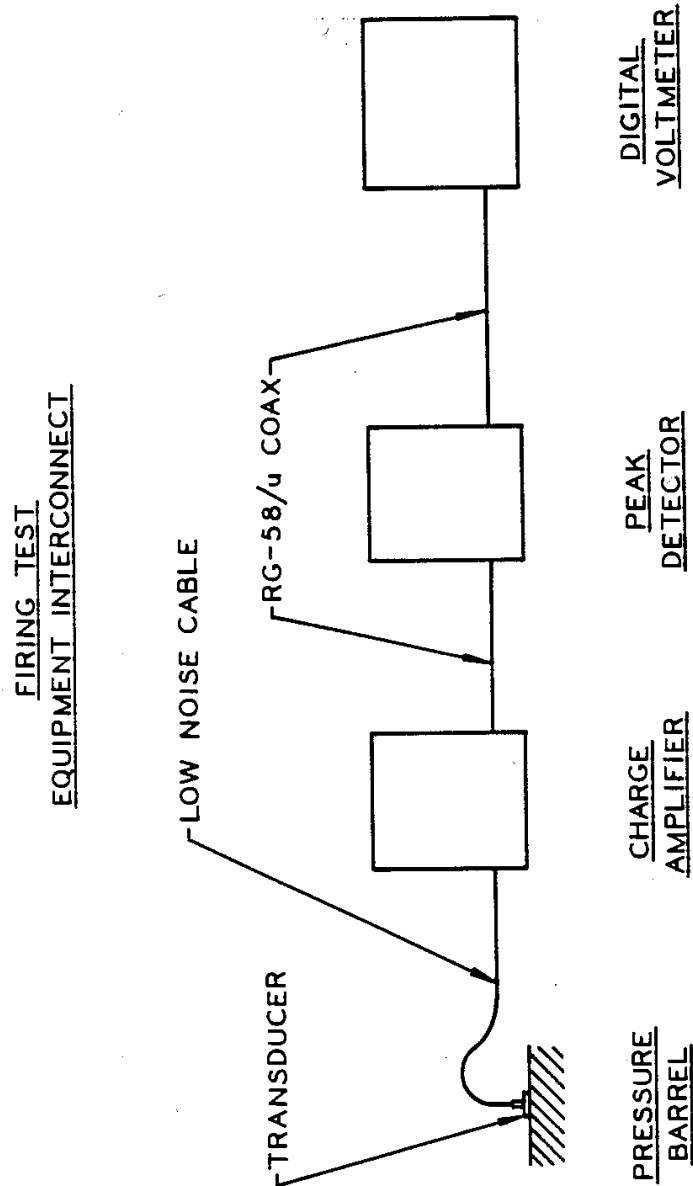


FIGURE 5

SECTION II - PROCEDURES  
CENTERFIRE PISTOL & REVOLVER  
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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.

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 user has homogenized the Reference Lot before use.
  - b) The ammunition is tested only after being conditioned under controlled temperature and humidity.
  - c) The ammunition is tested in standard test equipment.
  - d) The ammunition is handled strictly in accordance with the specified method.
  - e) All auxiliary measuring equipment is in proper working condition.
2. Although there will be changes with 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.

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SAAMI VOLUNTARY PERFORMANCE STANDARDS

REFERENCE AMMUNITION - USE

The average velocity and average pressure that may be developed by a sample of Reference Ammunition in any given gun under given conditions may be different from the results obtained under the test conditions referred to above in assumption 1. Such values may be perfectly real, providing no errors are introduced by the auxiliary equipment. However, the average of any ten round test with a lot of Reference Ammunition, fired under the conditions listed above should fall within the limits given with the assessment of that lot under the heading, "Inclusion Limits @ 99.95%."

In order to realize the benefits of Reference Ammunition, some rules must be adhered to. Nevertheless, the final judgments concerning how often it is used and the use of the data must be made by each individual user. 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 other 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 homogenized at each station or range and conditioned before use.
- B. How often Reference Ammunition is used shall be determined by the accuracy required.
- C. The minimum sample size shall be ten rounds.
- D. The Upper and Lower "Inclusion Limits" for both velocity and pressure are the limits within which the averages of a ten round test may be expected to fall 99.95% of the time.
- E. A correction need not be applied to the test equipment as long as the velocity and pressure averages are within the Inclusion Limits set forth in the most current Technical Services Report.
- F. If one average is outside of the Inculsion Limits and the other within, the average that exceeds the limits shall be corrected according to the procedure given in step H.

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REFERENCE AMMUNITION - USE

- G. If both averages are outside of the Inclusion Limits, a second ten round test should be fired to verify the data.
- H. If the correction is to be applied, the correction shall be the difference between the assessed value and the observed average of the twenty round test.



### SECONDARY REFERENCE AMMUNITION

Occasionally, a test station will have need for an inordinately large supply of Reference Ammunition in considerable excess of 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 number. The secondary reference lot should be approximately equivalent to the Reference Ammunition which it replaces.

NEW REFERENCE LOTS.

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 which is responsible for maintaining a supply. A five-year supply is recommended. It is desirable that Reference Ammunition be consistent with established values for that particular round.

When a new lot has been prepared by a producer, it shall be his responsibility to announce the lot to the SAAMI Office, giving a tentative assessment and other data. (See Pg. 84)

The SAAMI Office will announce the availability of the new lot to the participating ranges, giving the tentative assessment and other pertinent data. (See Pg. 84)

II. METHOD OF ASSESSMENT - NEW LOTS

- A. Before announcing a new lot of Reference Ammunition to the SAAMI Office, the manufacturer should make sufficient tests to determine Tentative Values of pressure and velocity for the lot.
1. The test barrels shall conform to SAAMI specifications for internal dimensions, length and piston location.
  2. Counter-chronographs and photoelectric screens shall be used in velocity measurements. (See Pg. 90)
  3. Ammunition shall be conditioned for 24 hours at  $70^{\circ} \pm 2^{\circ}\text{F}$  ( $21.1^{\circ} \pm 1.1^{\circ}\text{C}$ ) with relative humidity of  $60\% \pm 5\%$  before firing.
  4. Only an approved crusher lot shall be used in pressure measurements.

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REFERENCE AMMUNITION - NEW

NEW REFERENCE LOT REPORTING  
FORM AND INSTRUCTIONS

These instructions pertain to the form shown on page 84, which is used for a Reference Ammunition producer to announce new lots to the SAAMI Office, as well as for the SAAMI Office to announce the new lot to participating ranges.

SUBJECT: T-4025 Reference Ammunition Centerfire Pistol  
& Revolver,

TO: (When used by a producer):

SAAMI OFFICE

(When used by SAAMI Office to notify test stations):

Current address of all stations and personnel.

(1) Name and address of  
source for procurement

SIGNED: Authorized Person  
Producer Company Name  
Address. (Include Zip Code).

DATE:

SECTION II - PROCEDURES  
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REFERENCE AMMUNITION - NEW

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:

\_\_\_\_\_  
VELOCITY (ft/s)  
Average                      S.D.

\_\_\_\_\_  
PRESSURE (CUP)  
(in Units of 100)  
Average                      S.D.

Lot Number This Replaces \_\_\_\_\_

Please order the ammunition, test and report results to the  
SAAMI Office on the proper form as soon as possible. Address your  
orders to the address given in the left-bottom corner of this letter.

ADDRESS ORDER TO:

SIGNED:

DATE:

## SAAMI REFERENCE AMMUNITION

THIS AMMUNITION IS TO BE USED ONLY FOR CALIBRATION  
OF TEST GAGES FOR VELOCITY AND PRESSURE

### LOT NUMBERING SYSTEM (TYPICAL NUMBERS)

C.F. LOT 38-130-2 WW

CALIBER  
BULLET WEIGHT  
LOT NUMBER  
LOADING COMPANY

### LOT SYMBOLS - MANUFACTURER

WW = OLIN  
F = FEDERAL  
R = REMINGTON  
H = HORNADY

NOTE  
BLACK LETTERING

ASSESSMENT - PERIODIC

I. PROCUREMENT

Reference Ammunition is procured as noted on page 152.

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 location.
  - (c) Counter chronographs and photoelectric screens shall be used in velocity measurements. (See page 90)
  - (d) Ammunition shall be conditioned for 72 hours at  $70^{\circ} \pm 2^{\circ}\text{F}$  ( $21.1^{\circ} \pm 1.1^{\circ}\text{C}$ ) with relative humidity of  $60\% \pm 5\%$  before firing.
  - (e) Only an approved crusher lot shall be used in pressure measurements. (See page 137 for proper crusher sizes.)
2. Each station should report results of its firing in the test on approved forms to the SAAMI Office. A sample of the report form is shown on page 88.

II. PERIODIC TESTS (continued)

B. Clearing House

1. The SAAMI Office serves as a clearing house for all Reference Ammunition ballistics and related information. It shall be the responsibility of the SAAMI 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, Page 89)
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 Office will calculate and report the Raw Average, Corrected Average, Standard Deviation Averages and Inclusion Limits.
3. To obtain the Raw Averages, the SAAMI Office shall include the 10 round averages for mean pressure and velocity of all reporting stations. If the 10 round average from any station varies from the Raw Average by more than plus or minus 35 feet per second on velocity or plus or minus 2500 psi or CUP on pressure, the pressure or velocity data from that station(s) should be discarded. The mean pressure and velocity 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 Correct Averages, the Inclusion Limits (at 99.95%) 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 + 2500 CUP (psi)  
LOW = Mean - 2500 CUP (psi)

SECTION II - PROCEDURES  
 CENTERFIRE PISTOL & REVOLVER  
 SAAMI VOLUNTARY PERFORMANCE STANDARDS

REFERENCE AMMUNITION

T-4025  
 STATION REPORT  
 REFERENCE AMMUNITION - PERIODIC ASSESSMENT  
 CENTERFIRE PISTOL & REVOLVER

STATION \_\_\_\_\_

SAAMI REFERENCE LOT \_\_\_\_\_

DATE \_\_\_\_\_

PREVIOUS ASSESSMENT

Velocity \_\_\_\_\_

Pressure Bbl. No. \_\_\_\_\_

Pressure \_\_\_\_\_

Pressure Bbl. History \_\_\_\_\_

Velocity Bbl. No. \_\_\_\_\_

Type of Gage \_\_\_\_\_

Velocity Bbl. History \_\_\_\_\_

No. \_\_\_\_\_

	VELOCITY	PRESSURE
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

AVG. \_\_\_\_\_

OFFSET \_\_\_\_\_

CORR. AVG. \_\_\_\_\_

S.D. \_\_\_\_\_



SECTION II - PROCEDURES  
 CENTERFIRE PISTOL & REVOLVER  
 SAAMI VOLUNTARY PERFORMANCE STANDARDS

REFERENCE AMMUNITION - ASSESSMENT

TECHNICAL SERVICES REPORT - REFERENCE AMMUNITION  
 PERIODIC ASSESSMENT - CENTERFIRE PISTOL & REVOLVER  
 APRIL - 1992

LOT NO: 357MAG-158-11WW

GAGE: PIEZO

	VELOCITY	S.D.	PRESSURE	S.D.	OFFSET
BLOUNT	1605	21.0	280	16.1	73
FEDERAL	1575	19.0	291	16.0	54
HERCULES	1563	22.0	274	15.4	69
HORNADY	1559	11.0	281	7.7	88
OLIN - MFG.	1556	12.0	286	10.0	108
OLIN - ST.M.	1554	21.0	282	13.2	90
REM - LONOKE	1557	8.2	260	8.3	84
1ST PREV. AVG.	1557		274		
2ND PREV. AVG.	1560		277		

	VELOCITY	S.D.	PRESSURE	S.D.
RAW AVG.	1565		278	
CORRECTED AVG.	1560		278	
INCLUSION LIMITS @ 99.95%				
UPPER LIMIT	1595		303	
LOWER LIMIT	1525		253	
ASSESSMENT:.....	1560		278	

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

LIST OF EQUIPMENT  
CRUSHER

LIST OF EQUIPMENT

1. Electronic Counter chronograph - 100 kilohertz (minimum)  
Oehler Research, Electronic Counters, Inc. or equivalent.
2. Lumiline photoelectric screens  
Oehler Research, Electronic Counters, Inc. or equivalent
3. Machine rest - Frankford Arsenal type
4. Receiver
  - a. Universal Receivers - Cannatech, Inc.
  - b. Other Equivalent
5. Barrels
  - a. Drawings of test barrels are shown in Section III,  
pages 97 and 98.
6. Piston and piston hole (Pg. 145)
7. Piston and piston hole gages (Pgs. 146 and 147)
8. Oil - piston and gas check (Pg. 148)
9. Gas Check (Pg. 142)
10. Gas Check Tools - seating and knockout (Pg. 143)
11. Gas Check Wax (Pg. 144)
12. Crusher Cylinders - Manufacture
13. Crusher Cylinders - .146" x .400" - copper (Pg. 139)  
.225" x .500" - copper (Pg. 140)  
.225" x .400" - copper (Pg. 141)
14. Tarage Table - supplied with each lot of crusher cylinders  
Sample Table: .225" x .500" - copper/.206 piston  
(Pg. 138)

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

LIST OF EQUIPMENT  
CRUSHER

LIST OF EQUIPMENT (continued)

- 15. Measuring device - crusher cylinder
  - a. Micrometer 1" calibrated in .001"
  - b. Platform dial indicator - calibrated in .001"
  - c. Platform dial indicator - calibrated in Copper Units of Pressure (CUP).
- 16. Reference Ammunition
  - a. Supply (Pg. 152)

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

VELOCITY & PRESSURE TESTING  
TRANSDUCER

LIST OF EQUIPMENT

1. Electronic Counter Chronograph - 100 Kiloherzt (minimum)  
Oehler Research or equivalent
2. Lumiline photoelectric screens  
Oehler Research or equivalent
3. Machine rest - Frankford Arsenal type  
Cannatech, Inc. or equivalent
4. Receiver
  - a. Universal Receiver  
Cannatech, Inc.
  - b. Equivalent
5. Barrels
  - a. Remington Arms Co., Inc.
  - b. Wilson Arms Co.
  - c. H-S Precision
  - d. Equivalent
6. Digital Voltmeter
  - a. Digitec Model 276-3
  - b. Fluke Model 8110A
  - c. Equivalent

LIST OF EQUIPMENT (continued)

- 7. Charge Amplifier
  - a. PCB Inc., Model 462B52
  - b. Equivalent
- 8. Peak Detector
  - a. PCB Model 451A07
  - b. Equivalent
- 9. Transducer
  - a. PCB Model 117BXX
  - b. Equivalent
- 10. Low Noise Cable
  - a. PCB Model 003A05
  - b. Equivalent
- 11. Transducer Calibrator
  - a. PCB Model 095A Series
  - b. Equivalent
- 12. Calibration Fixture
  - a. PCB Model 090B Series
  - b. Equivalent

SECTION III - EQUIPMENT  
CENTERFIRE PISTOL AND REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

RECOMMENDED EQUIPMENT SOURCES

- |                                   |  |
|-----------------------------------|--|
| 1. Electronic Counter Chronograph | Oehler Research<br>P.O. Box 9135<br>Austin, Texas 78766  |
| 2. Photoelectric Screens          | Oehler Research<br>P.O. Box 9135<br>Austin, Texas 78766  |
| 3. Gun Rest                       | Cannatech, Inc.<br>15 Springhollow Drive<br>Erial, New Jersey 08081  |
| 4. Receivers                      | Cannatech, Inc.<br>15 Springhollow Drive<br>Erial, New Jersey 08081  |
| 5. Barrels                        | Remington Arms Co., Inc.<br>Attn: Custom Shop<br>14 Hoefler Avenue<br>Ilion, New York 13357<br><br>Wilson Arms Co.<br>63 Leetes Island Rd.<br>Branford, Connecticut 06405<br><br>H-S Precision, Inc.<br>1301 Turbine Drive<br>Rapid City, SD 57701 |
| 6. Digital Voltmeter              | John Fluke Mfg. Co., Inc.<br>6920 Seaway Blvd.<br>Everett, WA 98206  |
| 7. Charge Amplifier               | PCB Piezotronics, Inc.<br>3425 Walden Ave.<br>Depew, NY 14043-2495   |
| 8. Peak Detector                  | PCB Piezotronics, Inc.<br>3425 Walden Ave.<br>Depew, NY 14043-2495   |

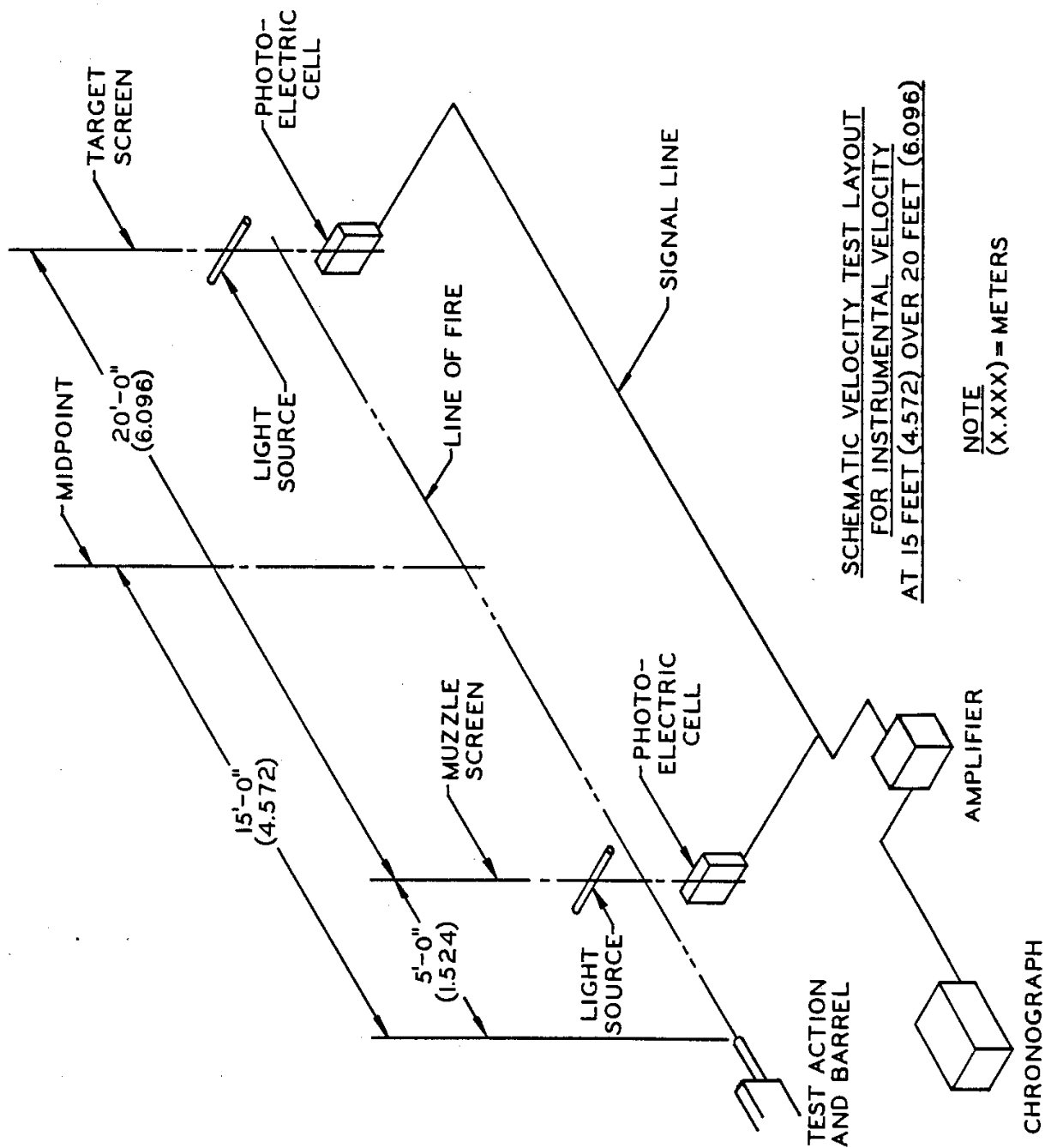
SECTION III - EQUIPMENT  
CENTERFIRE PISTOL AND REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

RECOMMENDED EQUIPMENT SOURCES

9. Transducer	PCB Piezotronics, Inc. 4325 Walden Ave. Depew, NY 14043-2495
10. Low Noise Cable	PCB Piezotronics, Inc. 4325 Walden Ave. Depew, NY 14043-2495
11. Transducer Calibrator	PCB Piezotronics, Inc. 4325 Walden Ave. Depew, NY 14043-2495
12. Calibration Fixture	PCB Piezotronics, Inc. 4325 Walden Ave. Depew, NY 14043-2495

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

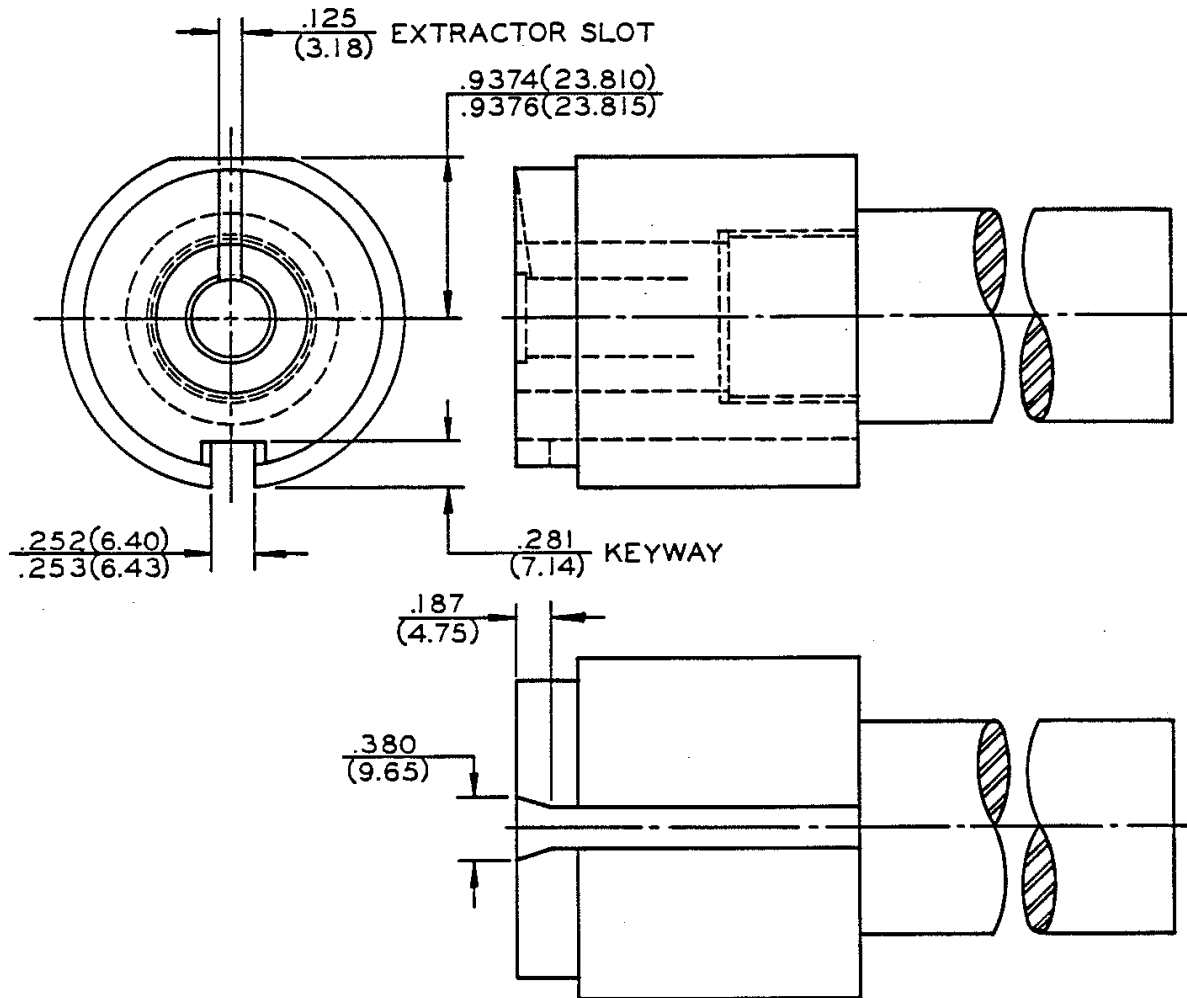
SCHEMATIC VELOCITY LAYOUT-  
SCREENS





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

UNIVERSAL RECEIVER COLLAR  
 AND TEST BARREL

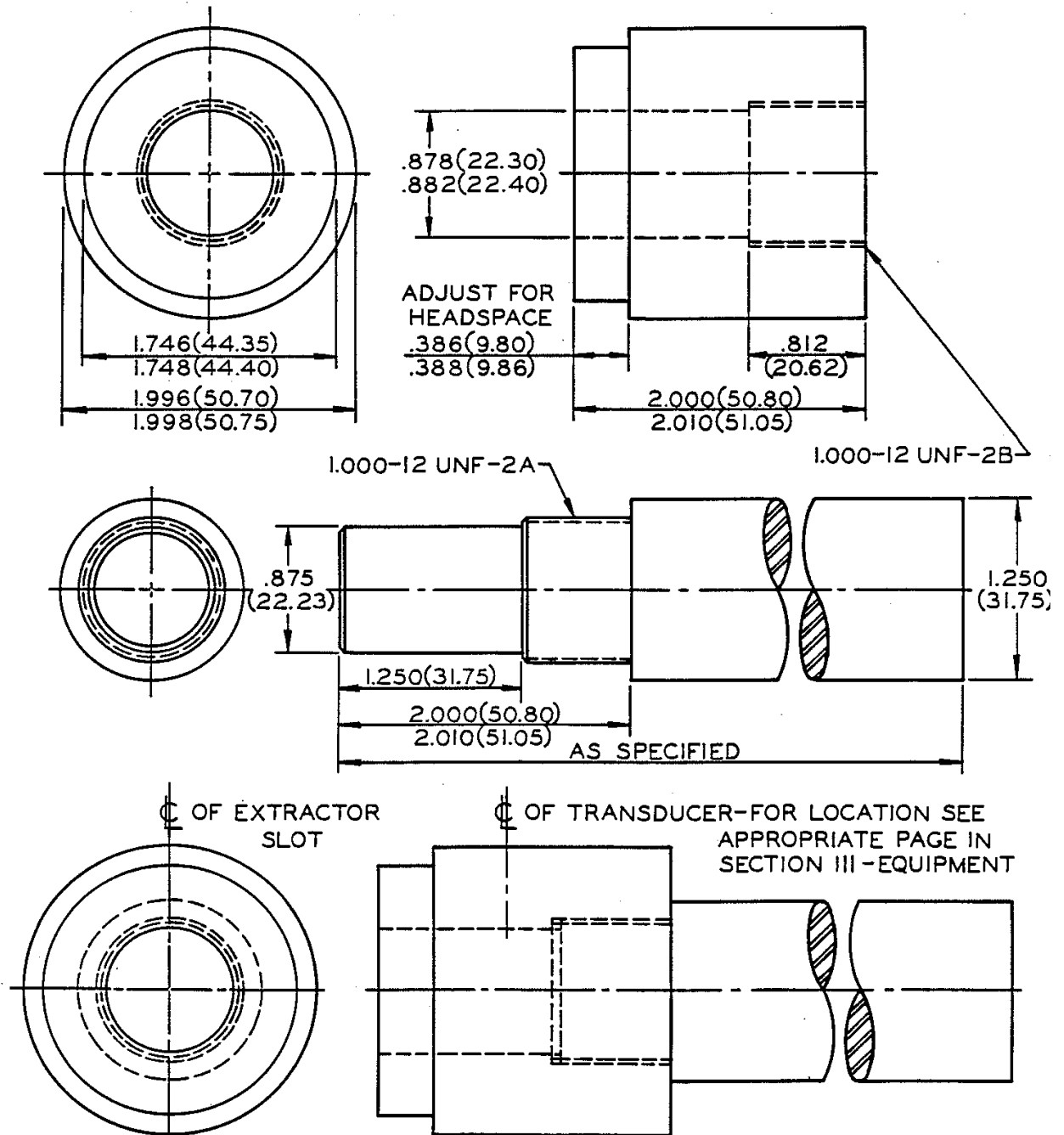


FOR DETAIL INFORMATION SEE PAGE 98

NOTE  
 (XX.XX) = MILLIMETERS

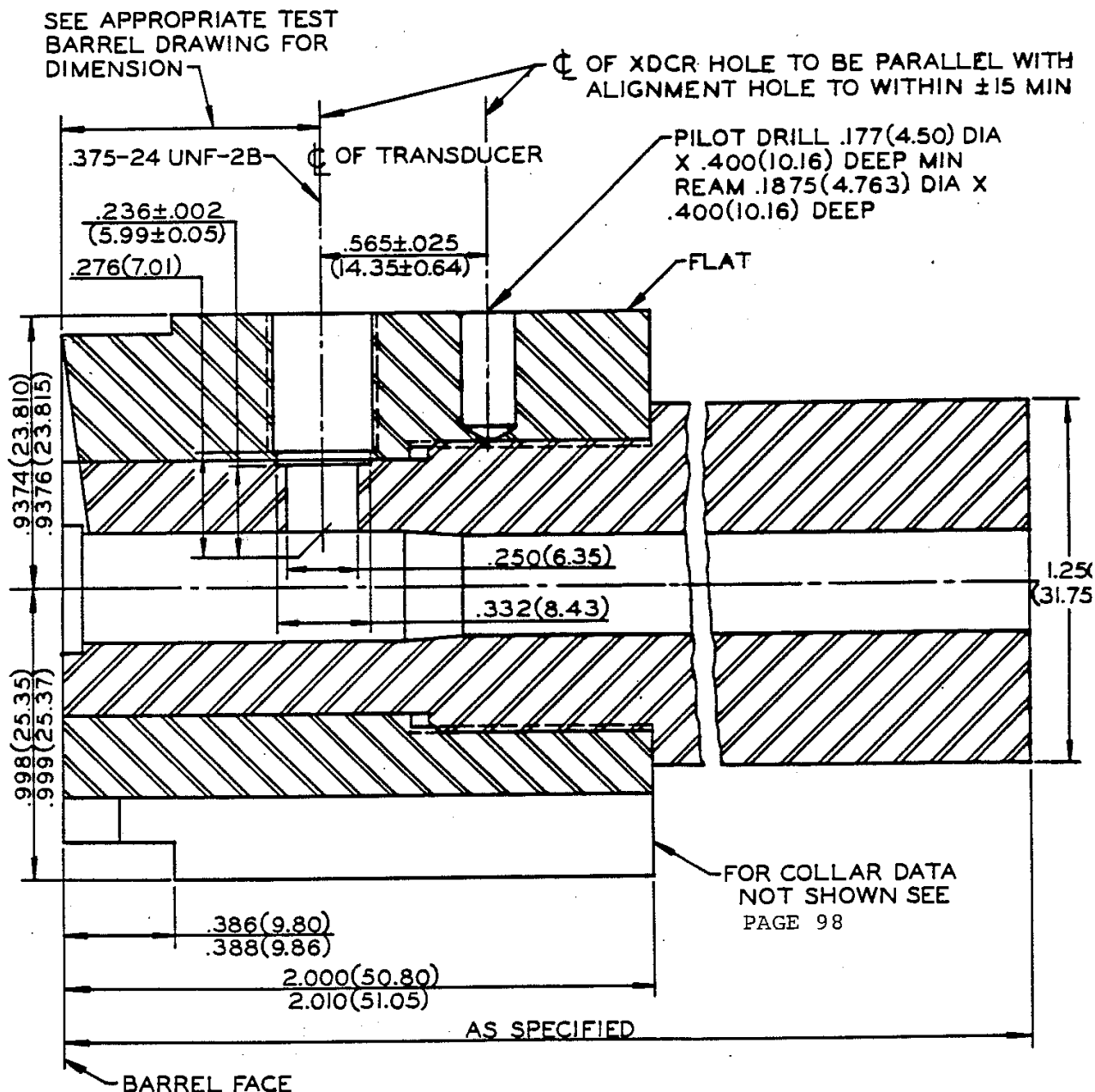
SECTION III - EQUIPMENT  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

UNIVERSAL RECEIVER COLLAR  
AND TEST BARREL



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

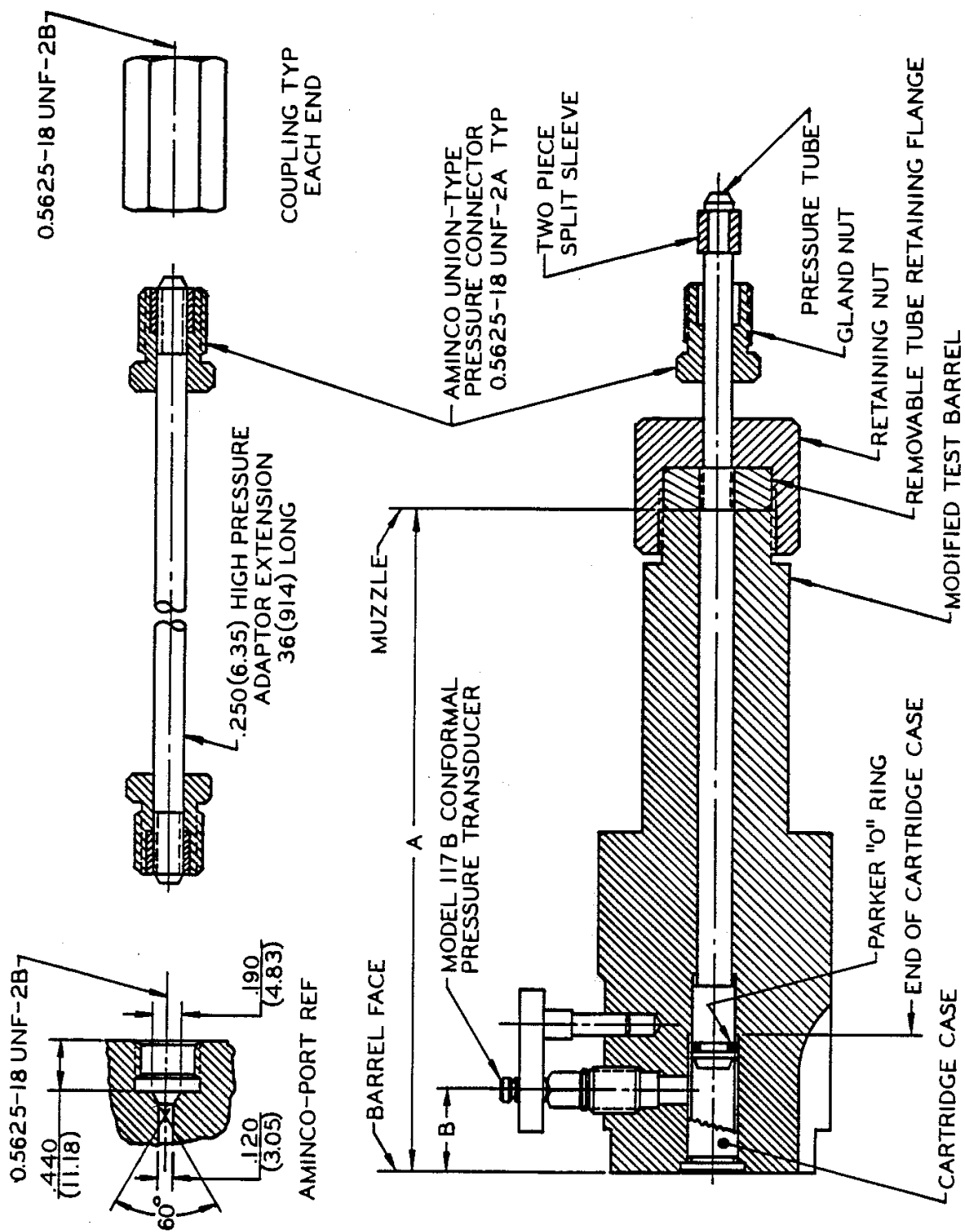
UNIVERSAL RECEIVER TEST BARREL  
INSTALLATION OF PRESSURE  
TRANSDUCERS



**NOTE**  
(XX.XX) = MILLIMETERS

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

IN BARREL TRANSDUCER CALIBRATOR



FOR DIMENSIONS A AND B SEE APPROPRIATE TEST BARREL DRAWING

TRANSDUCER LOCATION CRITERIA

I Transducer Location

The following criteria for transducer 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 cannellures 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 Cartridge Cases

Centerline of transducer shall be located behind the heel of the bullet by an amount that is equal to one-half the transducer diameter plus 0.005" (0.13)  $\pm$  0.003" (0.08). This criterion applies to both large diameter 0.250" (6.35) and small diameter 0.194" (4.93) transducers.

B. Bottleneck Cartridge Cases

Center line of transducer shall be located behind shell case shoulder intersection by an amount of 0.175" (4.44) for large diameter transducers 0.250" (6.35) and 0.150" (3.8) for small diameter transducers 0.194" (4.93).

II Transducer Diameter

Transducer diameter, 0.250" (6.35), is selected when the chamber diameter at transducer center line location is equal or greater than 0.350" (8.89).

Transducer diameter, 0.194" (4.93), is selected when the chamber diameter at transducer center line location is less than 0.350" (8.89).

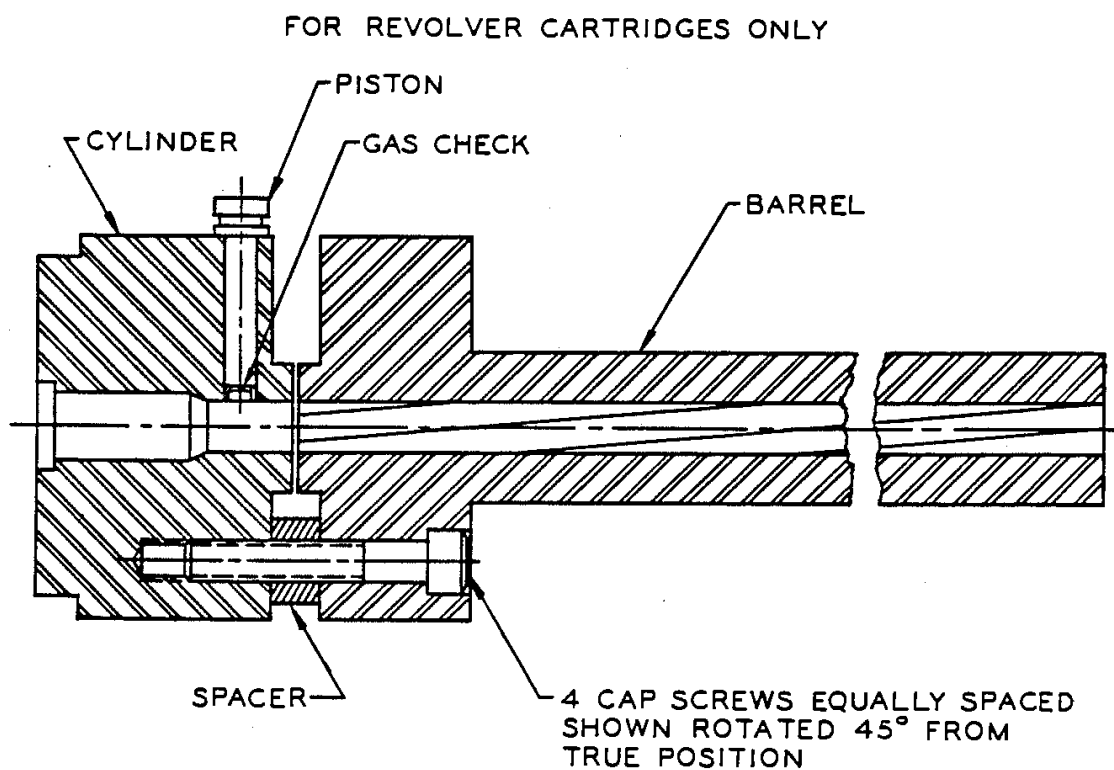
SECTION III - EQUIPMENT  
 CENTERFIRE PISTOL & REVOLVER  
 SAAMI VOLUNTARY PERFORMANCE STANDARDS

UNIVERSAL RECEIVER TEST BARRI  
TRANSDUCER LOCATION

<u>Cartridge</u>	<u>CENTER LINE OF TRANSDUCER FROM BOLT FACE*</u>		<u>Cartridge</u>	<u>CENTER LINE OF TRANSDUCER FROM BOLT FACI</u>	
	<u>Inches</u>	<u>mm</u>		<u>Inches</u>	<u>mm</u>
6mm BR Rem	0.896	22.8	38 LC	0.490	12.
7mm BR Rem	0.896	22.8	38 SC	0.490	12.
9mm Luger	0.425	10.8	38 S&W	0.390	9.
9mm Win Mag	0.830	21.1	38 Spl	0.600	15.
10mm Auto	0.424	10.8	38 Super Auto	0.550	14.
22 Rem Jet Mag			380 Auto	0.380	9.
221 Rem Fireball	0.891	22.6	40 S&W	0.360	9.
25 Auto	0.360	9.1	41 AE	0.452	11.
256 Win Mag	0.814	20.7	41 Rem Mag	0.760	19.
30 Luger	0.447	11.4	44 Rem Mag	0.730	18.
32 Auto	0.380	9.7	44 S&W Spl	0.640	16.
32 CNP	0.575	14.6	45 Auto	0.460	11.
32 LC	0.510	13.0	45 Auto Rim	0.399	10.
32 SC	0.415	10.5	45 Colt	0.640	16.
32 S&W	0.300	7.6	45 Win Mag	0.760	19.
32 S&WL	0.575	14.6	50 AE	0.770	19.
357 Mag	0.665	16.9			
357 Rem Max	0.780	19.8			
38 Auto	0.550	14.0			
38 CNP	0.390	9.9			

\* Tolerance Minus 0.010" (0.25mm)

All transducers are 0.250" (6.35mm) diameter except 25 Auto, 32 Auto, 32 CNP, 32 LC, 32 SC, 32 S&W and 32 S&WL, which are 0.194" (4.93mm).



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

STANDARD VELOCITY AND PRESSURE  
BARRELS DETERMINATION OF  
CALCULATED DIMENSIONS

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 will 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.

PROCEDURE FOR MEASURING BARREL LENGTH

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.

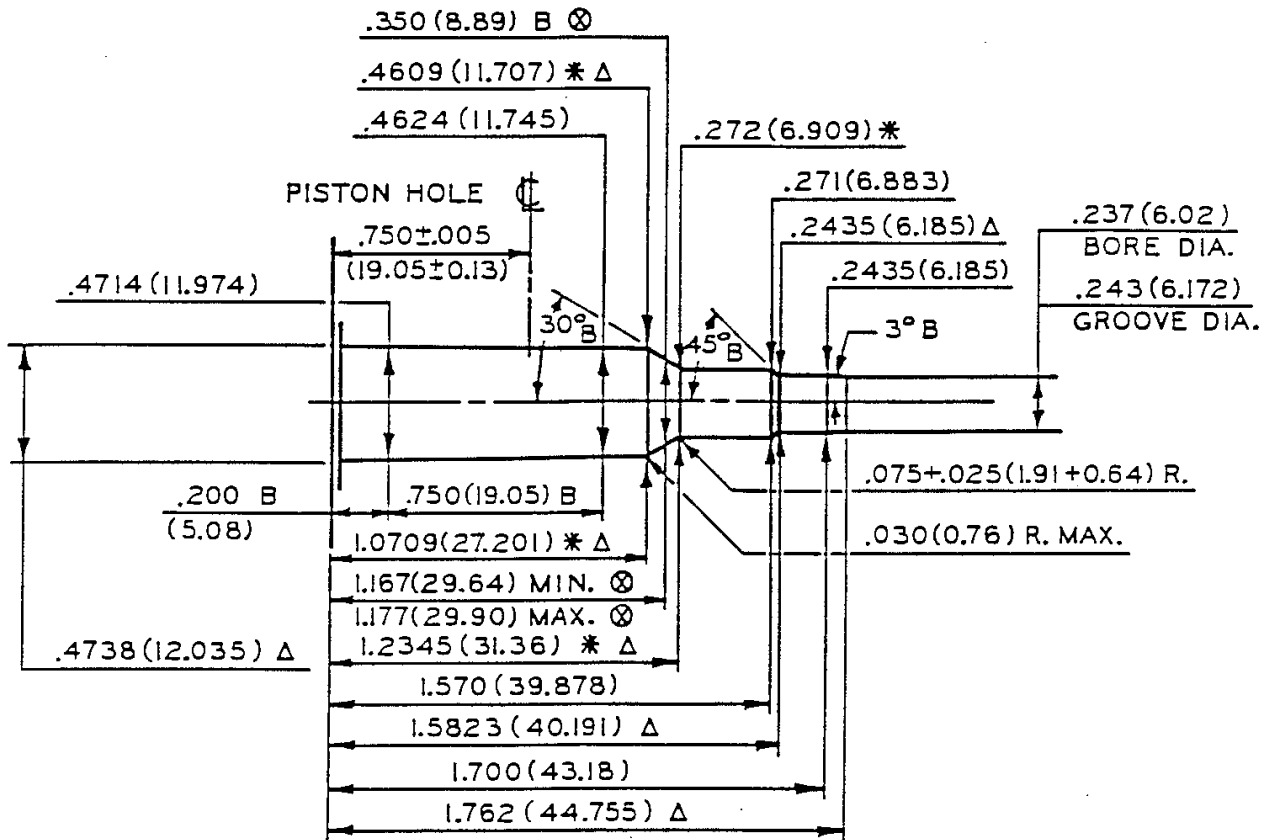
A stop collar or other marking means is utilized to mark the point on the rod adjacent to the most forward part of the barrel or the bottom of the counterbore in barrels having a counterbore recess at the muzzle.

The rod is then removed and the distance from the mark to the end of the rod is measured with a scale or rule. This is recorded as the barrel length.



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

STANDARD VELOCITY AND  
 PRESSURE BARREL  
 6mm BENCH REST REMINGTON



NO. OF GROOVES 6  
 WIDTH OF GROOVES .090 ± .002 (2.29 ± 0.05)  
 TWIST 9 (228.6) R.H. OPTIONAL  
 LENGTH OF BARREL 15 ± .010 (381.00 ± 0.25)  
 DIA. OF PISTON HOLE .206 (5.23)

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

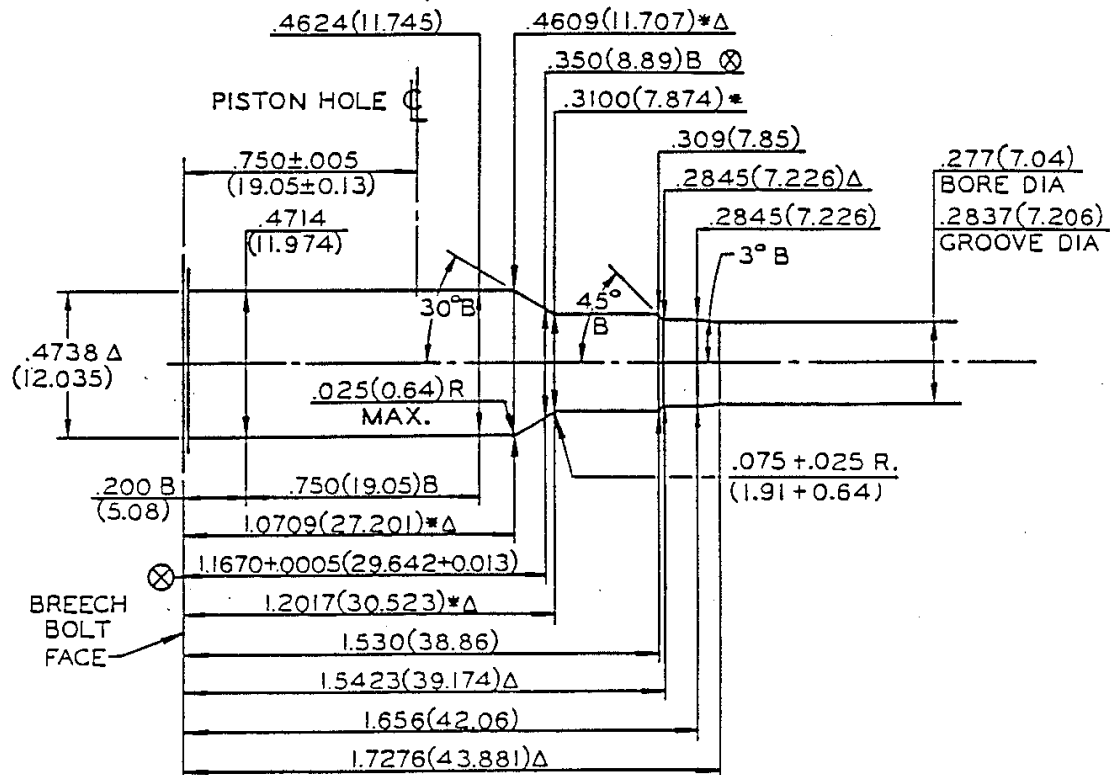
UNLESS OTHERWISE NOTED  
 ALL DIA. + .0005 (0.013)  
 LENGTH TOL. + .005 (0.13)

**NOTE**

B=BASIC Δ=REFERENCE DIMENSION ⊗=HEADSPACE DIMENSION  
 \* DIMENSIONS ARE TO INTERSECTION 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 AND  
 PRESSURE BARREL  
 7mm BENCH REST REMINGTON



NO. OF GROOVES 6  
 WIDTH OF GROOVES .110±.002(2.79±0.05)  
 TWIST 9.5(241.3) RH  
 LENGTH OF BARREL 15.000±.010(381.0±0.25)  
 DIA OF PISTON HOLE .206(5.23)

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

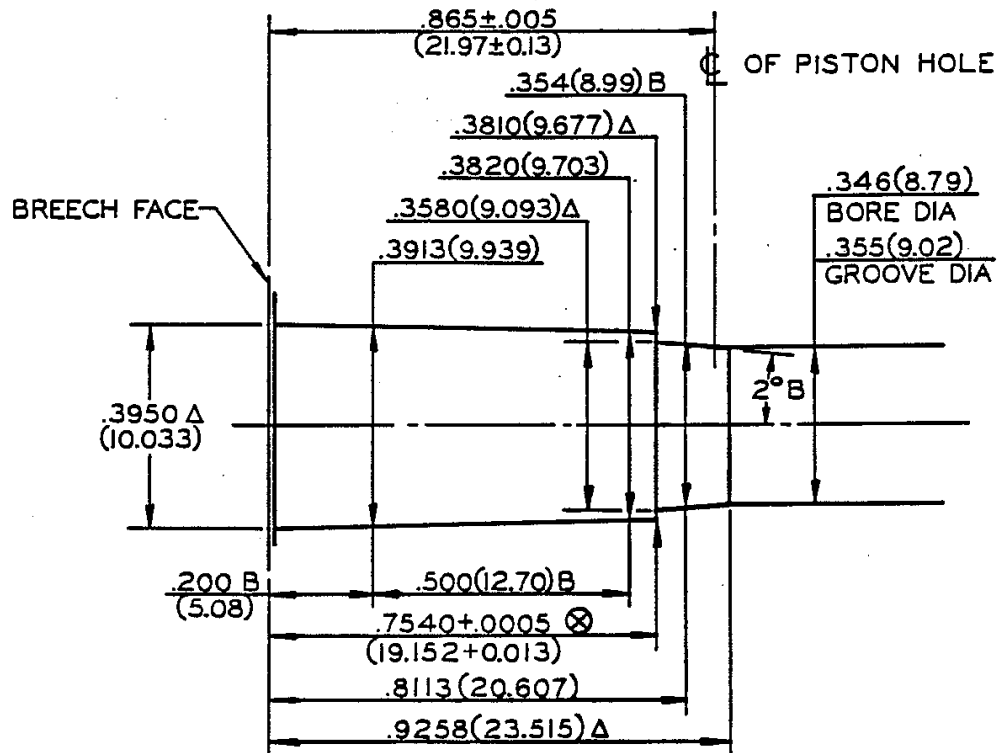
UNLESS OTHERWISE NOTED  
 ALL DIA +.0005(0.013)  
 LENGTH TOL +.005(0.13)

**NOTE**

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

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

STANDARD VELOCITY AND  
 PRESSURE BARREL  
 9mm LUGER  
 9mm LUGER+P



NO. OF GROOVES 6  
 WIDTH OF GROOVES  $.100 \pm .002$  (2.54  $\pm$  0.05)  
 TWIST 10 (254) RH  
 LENGTH OF BARREL  $4.000 \pm .010$  (101.60  $\pm$  0.25)  
 DIA OF PISTON HOLE .206 (5.23)

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

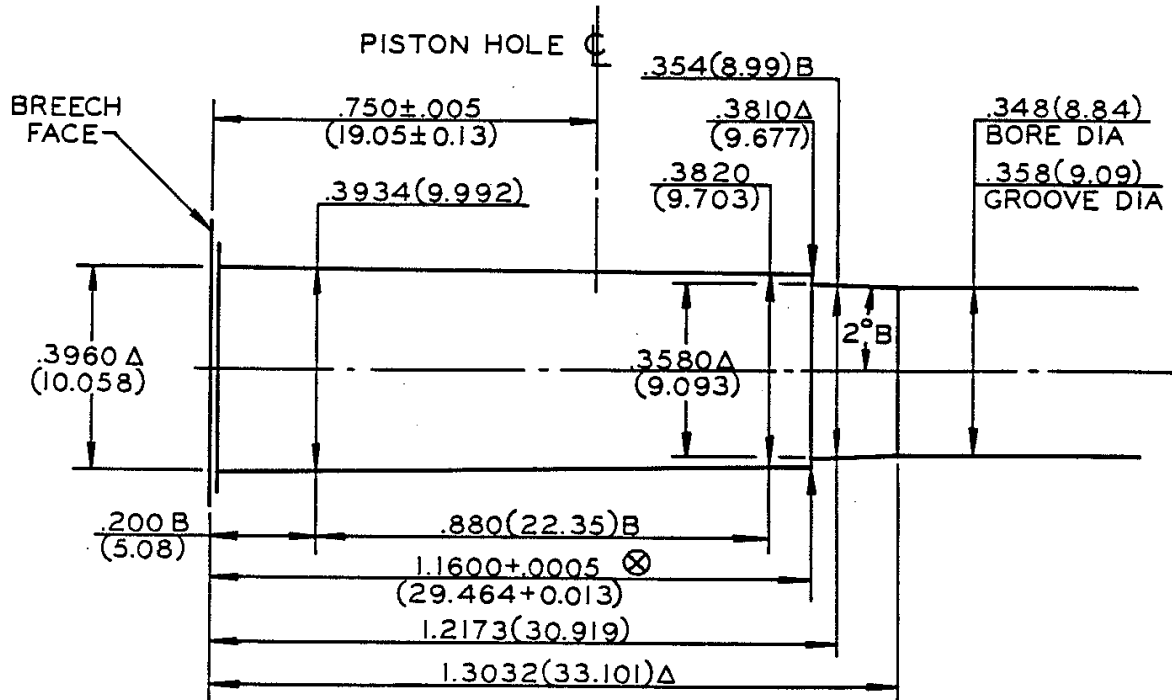
UNLESS OTHERWISE NOTED  
 ALL DIA  $+.0005$  (0.013)  
 LENGTH TOL  $+.005$  (0.13)

**NOTE**

B=BASIC (XX.XX)=MILLIMETERS  $\otimes$ =HEADSPACE DIMENSION  
 \* DIMENSIONS ARE TO INTERSECTION OF LINES  $\Delta$ =REFERENCE DIMENSION  
 ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

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

STANDARD VELOCITY AND  
 PRESSURE BARREL  
 9mm WINCHESTER MAGNUM



NO. OF GROOVES 6  
 WIDTH OF GROOVES .100±.002(2.54±0.05)  
 TWIST 10(254) RH  
 LENGTH OF BARREL 5.000±.010(127.00±0.25)  
 DIA OF PISTON HOLE .206(5.23)

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

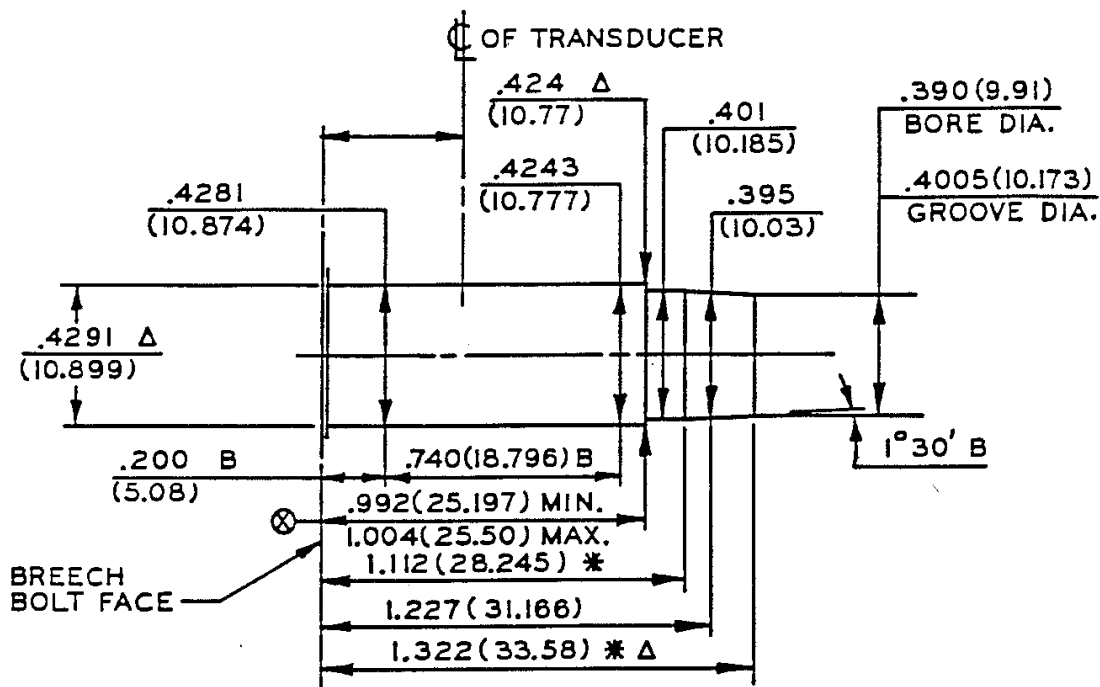
UNLESS OTHERWISE NOTED  
 ALL DIA +.0005(0.013)  
 LENGTH TOL +.005(0.13)

**NOTE**

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

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

STANDARD VELOCITY AND  
 PRESSURE BARREL  
 10mm AUTOMATIC



NO. OF GROOVES 6  
 WIDTH OF GROOVES .120+.002(3.05+.005) WIDE  
 TWIST 16(406.4) L H  
 LENGTH OF BARREL 5.000±.010 (127.0±0.25)

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

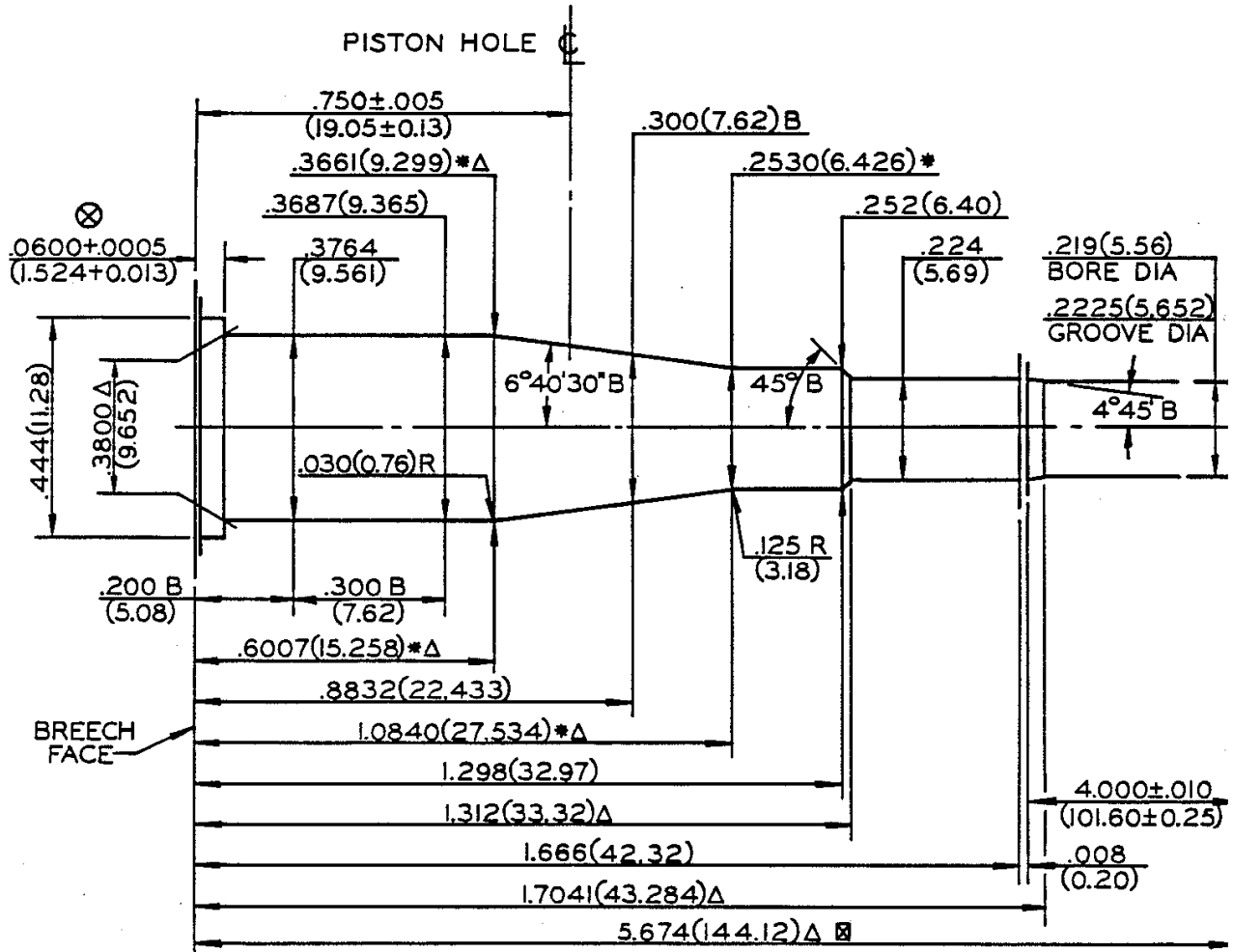
UNLESS OTHERWISE NOTED  
 ALL DIA. +.0005 (0.013)  
 LENGTH TOL. +.005 (0.13)

NOTE

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

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

STANDARD VELOCITY AND  
PRESSURE BARREL  
22 REMINGTON JET MAGNUM



NO. OF GROOVES 6  
WIDTH OF GROOVES .071 ± 0.002 (1.80 ± 0.05)  
TWIST 15 (381) RH  
DIA OF PISTON HOLE .206 (5.23)  
☒ ALTERNATE ONE PIECE BARREL LENGTH 10.125 ± 0.010 (257.18 ± 0.25)

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

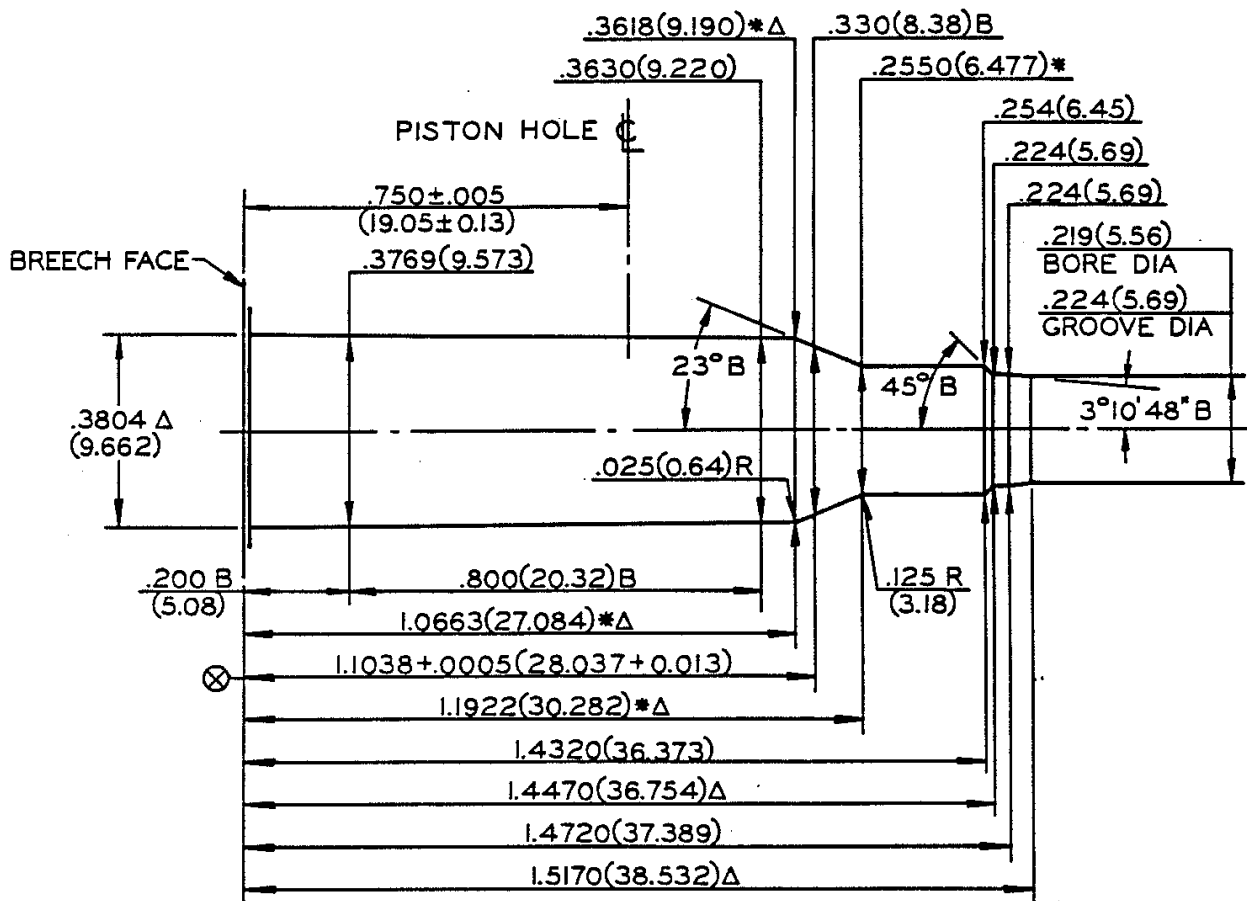
UNLESS OTHERWISE NOTED  
ALL DIA +.0005 (0.013)  
LENGTH TOL +.005 (0.13)

**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)

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

STANDARD VELOCITY AND  
PRESSURE BARREL  
221 REMINGTON FIREBALL



NO. OF GROOVES 6  
WIDTH OF GROOVES  $.080 \pm .002 (2.03 \pm 0.05)$   
TWIST 12 (304.8) RH  
LENGTH OF BARREL  $10.500 \pm .010 (266.70 \pm 0.25)$   
DIA OF PISTON HOLE  $.206 (5.23)$

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

UNLESS OTHERWISE NOTED  
ALL DIA  $+.0005 (0.013)$   
LENGTH TOL  $+.005 (0.13)$

**NOTE**

B=BASIC

(XX.XX)=MILLIMETERS

⊗=HEADSPACE DIMENSION

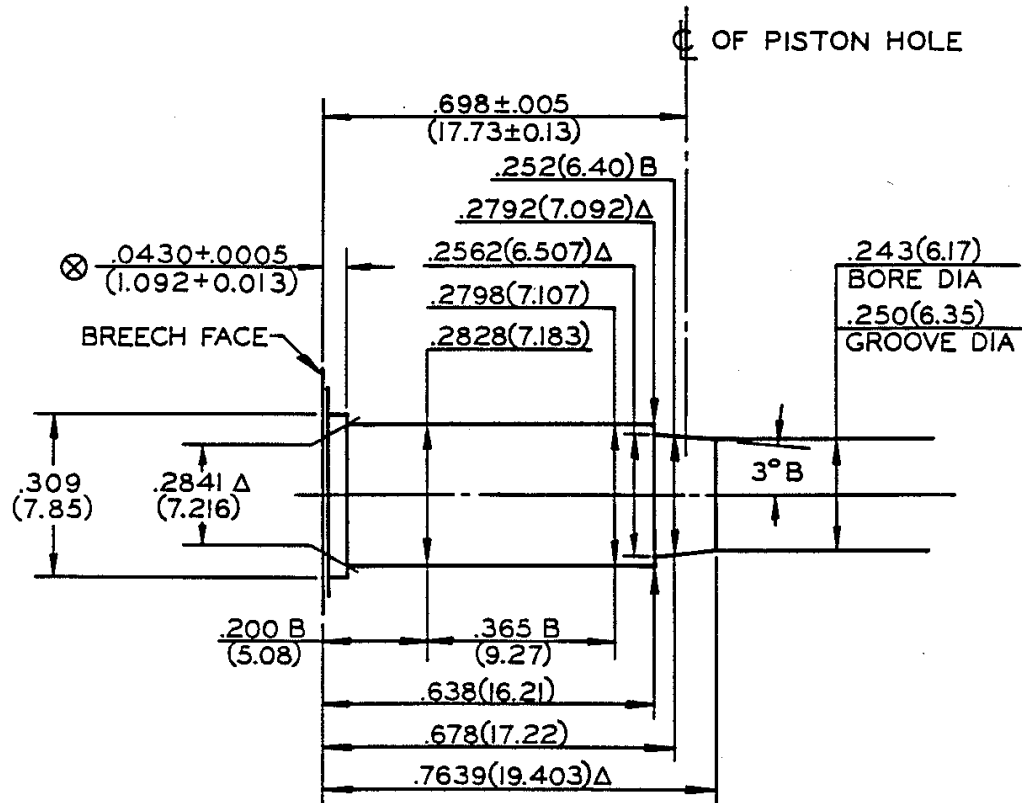
\* DIMENSIONS ARE TO INTERSECTION OF LINES

Δ=REFERENCE DIMENSION

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

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

STANDARD VELOCITY AND  
 PRESSURE BARREL  
 25 AUTOMATIC



NO. OF GROOVES	6
WIDTH OF GROOVES	.086 ± .002 (2.18 ± 0.05)
TWIST	16 (406.4) LH
LENGTH OF BARREL	2.000 ± .010 (50.80 ± 0.25)
DIA OF PISTON HOLE	.146 (3.71)

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

UNLESS OTHERWISE NOTED  
 ALL DIA +.0005 (0.013)  
 LENGTH TOL +.005 (0.13)

**NOTE**

B=BASIC

(XX.XX)=MILLIMETERS

\* DIMENSIONS ARE TO INTERSECTION OF LINES

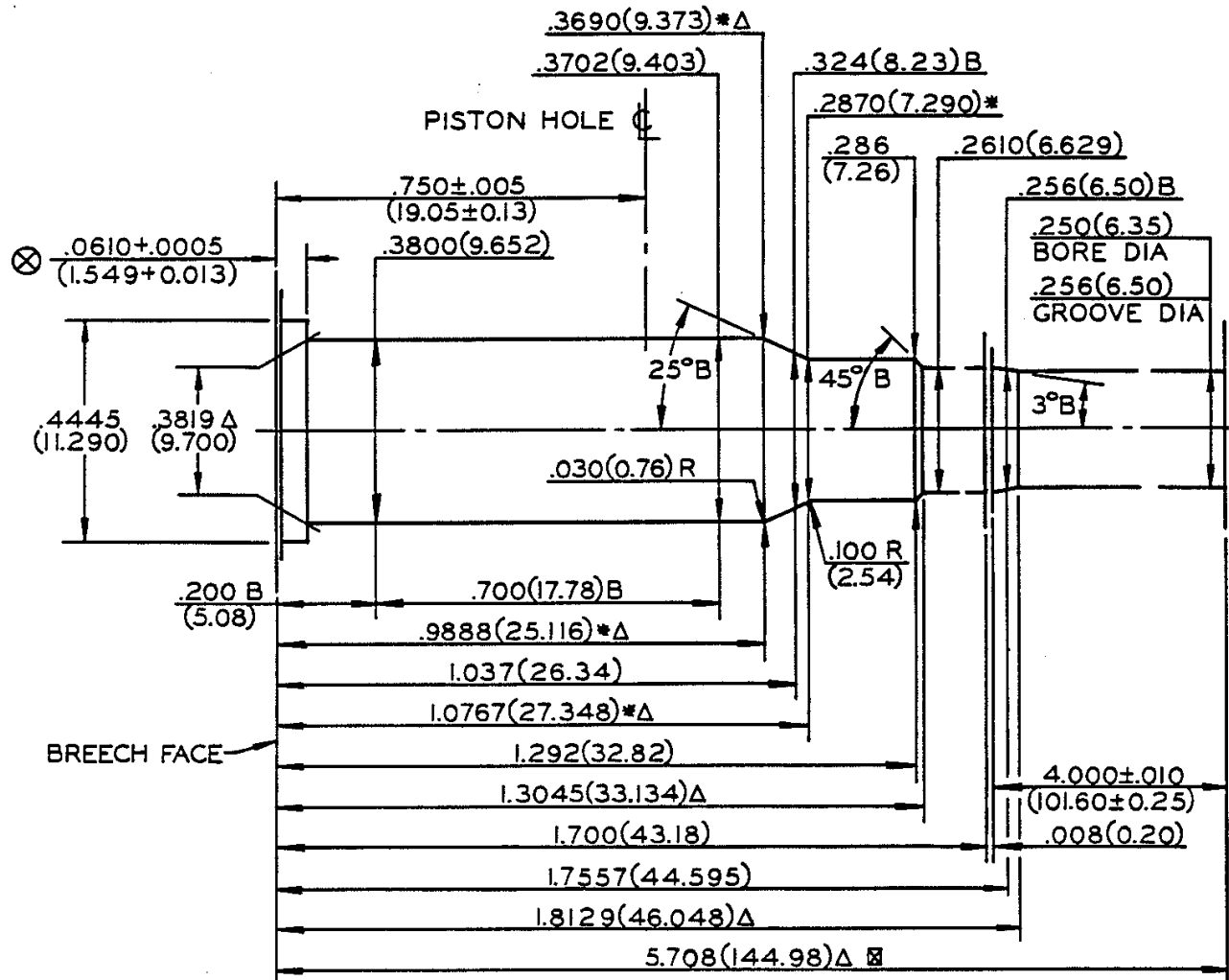
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

⊗=HEADSPACE DIMENSION  
 Δ=REFERENCE DIMENSION



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

STANDARD VELOCITY AND  
PRESSURE BARREL  
256 WINCHESTER MAGNUM



NO. OF GROOVES 6  
WIDTH OF GROOVES .079±.002(2.01±0.05)  
TWIST 14 (355.6) RH  
DIA OF PISTON HOLE .206 (5.23)  
☒ ALTERNATE ONE PIECE BARREL LENGTH 8.500±.010(215.90±0.25)  
LAND AND GROOVE DIMENSIONS TO BE WITHIN  
TOLERANCES THROUGHOUT LENGTH OF BARREL

UNLESS OTHERWISE NOTED

ALL DIA +.0005 (0.013)

LENGTH TOL +.005 (0.13)

**NOTE**

B=BASIC

(XX.XX)=MILLIMETERS

\* DIMENSIONS ARE TO INTERSECTION OF LINES

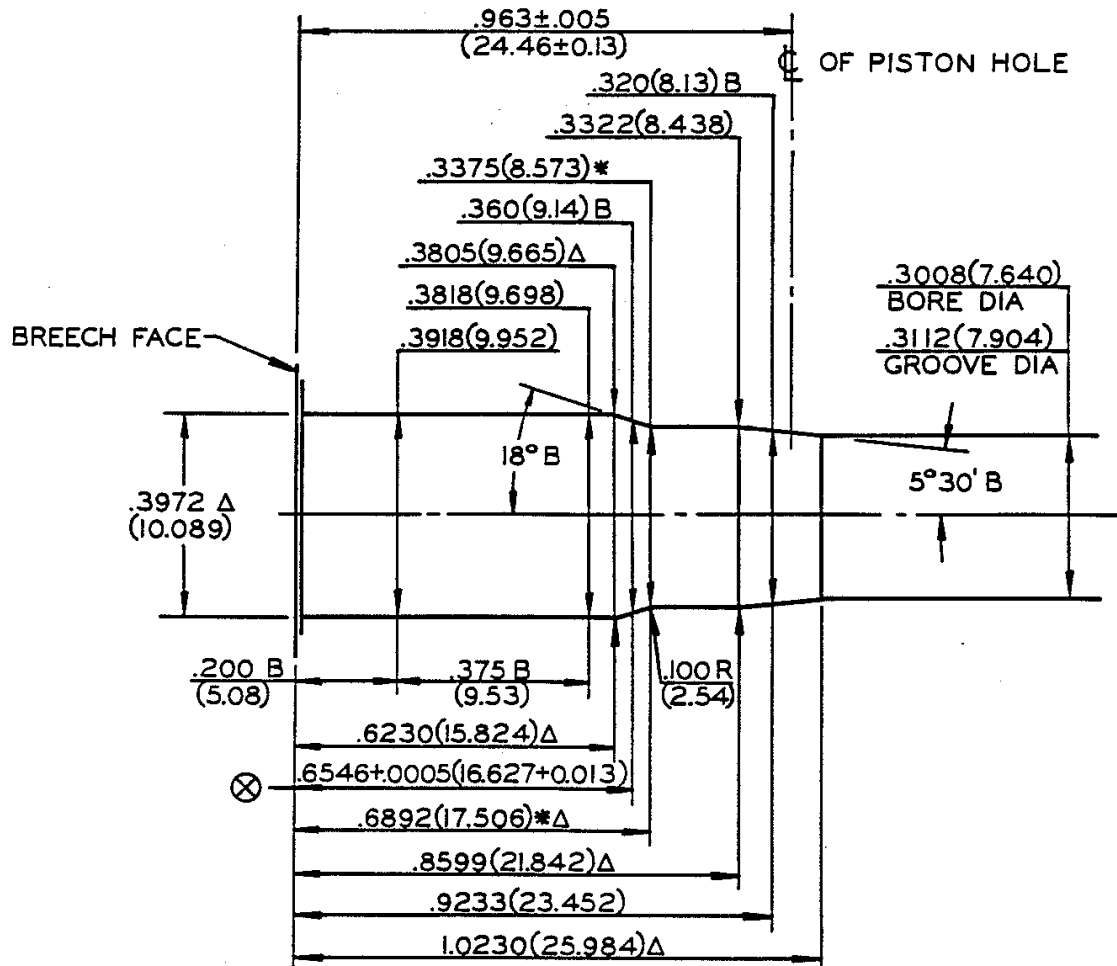
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

⊗=HEADSPACE DIMENSION

Δ=REFERENCE DIMENSION

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

STANDARD VELOCITY AND  
 PRESSURE BARREL  
 30 LUGER (7.65 mm)



NO. OF GROOVES	4
WIDTH OF GROOVES	.120±.002 (3.05±0.05)
TWIST	11 (279.4) RH
LENGTH OF BARREL	4.500±.010 (114.30±0.25)
DIA OF PISTON HOLE	.206 (5.23)

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

UNLESS OTHERWISE NOTED

ALL DIA ±.0005 (0.013)

LENGTH TOL ±.005 (0.13)

**NOTE**

B=BASIC

(XX.XX)=MILLIMETERS

⊗=HEADSPACE DIMENSION

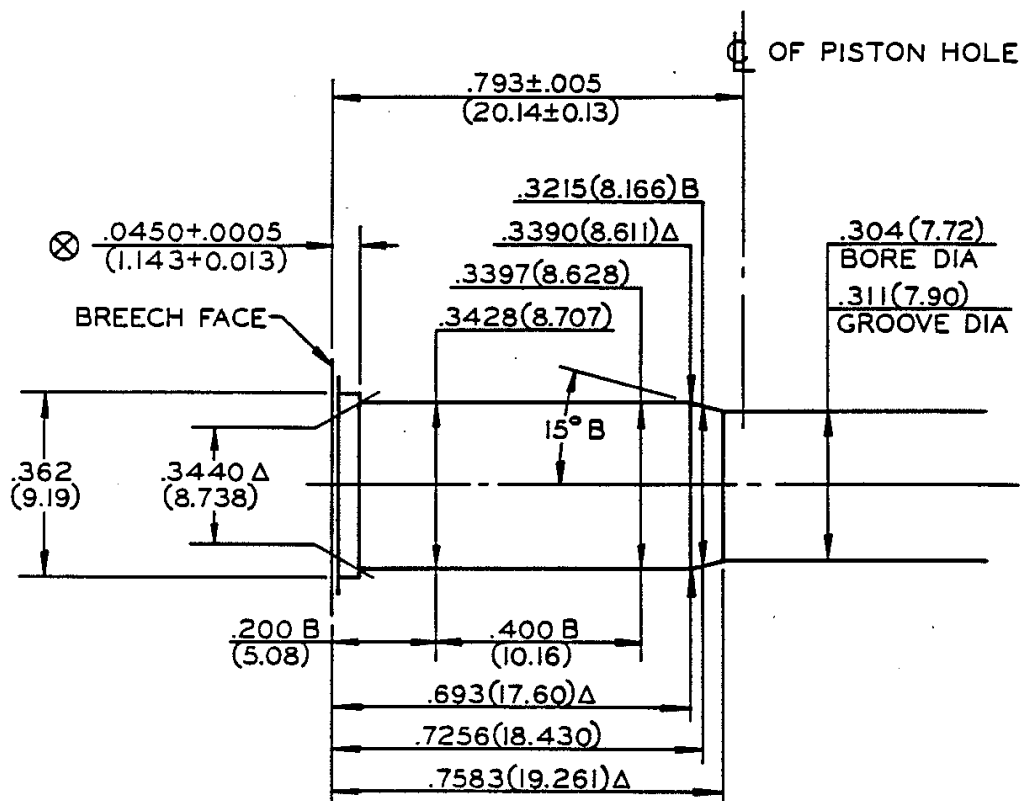
\* DIMENSIONS ARE TO INTERSECTION OF LINES

Δ=REFERENCE DIMENSION

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

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

STANDARD VELOCITY AND  
 PRESSURE BARREL  
 32 AUTOMATIC



NO. OF GROOVES	6
WIDTH OF GROOVES	$.106 \pm .002$ (2.69 ± 0.05)
TWIST	16 (406.4) LH
LENGTH OF BARREL	$4.000 \pm .010$ (101.60 ± 0.25)
DIA OF PISTON HOLE	.206 (5.23)

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

UNLESS OTHERWISE NOTED  
 ALL DIA  $\pm .0005$  (0.013)  
 LENGTH TOL  $\pm .005$  (0.13)

**NOTE**

B=BASIC

(XX.XX)=MILLIMETERS

\* DIMENSIONS ARE TO INTERSECTION OF LINES

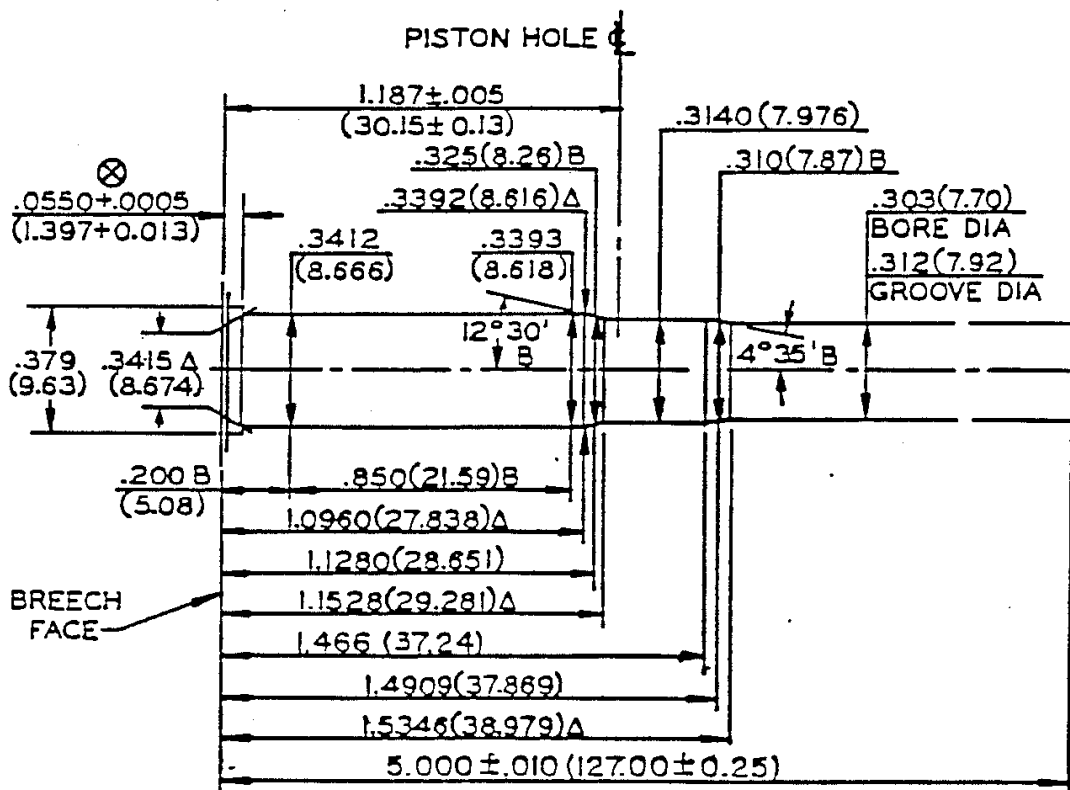
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

⊗=HEADSPACE DIMENSION

Δ=REFERENCE DIMENSION

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

STANDARD VELOCITY AND  
 PRESSURE BARREL  
 32 H&R MAGNUM



NO. OF GROOVES 5  
 WIDTH OF GROOVES .095±.002(2.41±0.05)  
 TWIST 16(406.40)LH  
 DIA OF PISTON HOLE .206(5.23)

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

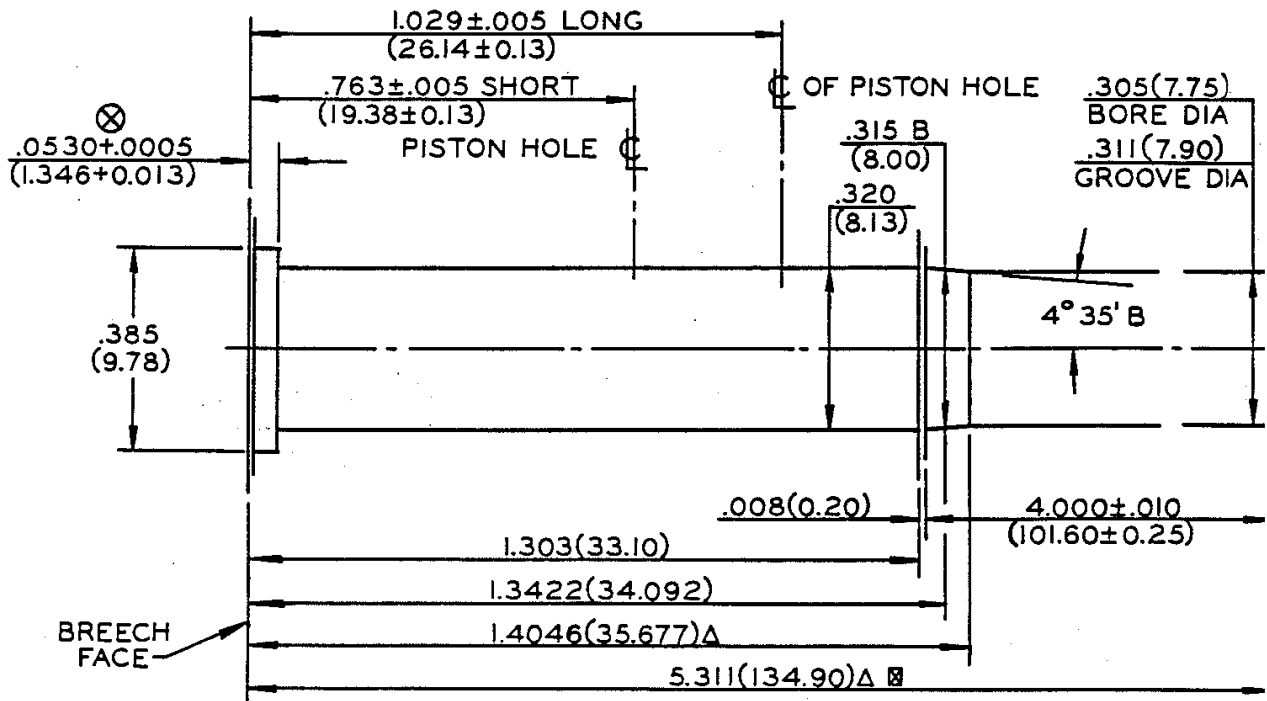
UNLESS OTHERWISE NOTED  
 ALL DIA ±.0005(0.013)  
 LENGTH TOL ±.005(0.13)

NOTE

B=BASIC Δ=REFERENCE DIMENSION ⊗=HEADSPACE DIMENSION  
 \* DIMENSIONS ARE TO INTERSECTION 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 AND  
 PRESSURE BARREL  
 32 LONG COLT  
 32 SHORT COLT



NO. OF GROOVES 6  
 WIDTH OF GROOVES .106 ± .002 (2.69 ± 0.05)  
 TWIST 16 (406.4) LH  
 DIA OF PISTON HOLE .206 (5.23)

☒ ALTERNATE ONE PIECE BARREL LENGTH 4.980 ± .010 (126.49 ± 0.25)

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

UNLESS OTHERWISE NOTED  
 ALL DIA +.0005 (0.013)  
 LENGTH TOL +.005 (0.13)

**NOTE**

B=BASIC

(XX.XX)=MILLIMETERS

\* DIMENSIONS ARE TO INTERSECTION OF LINES

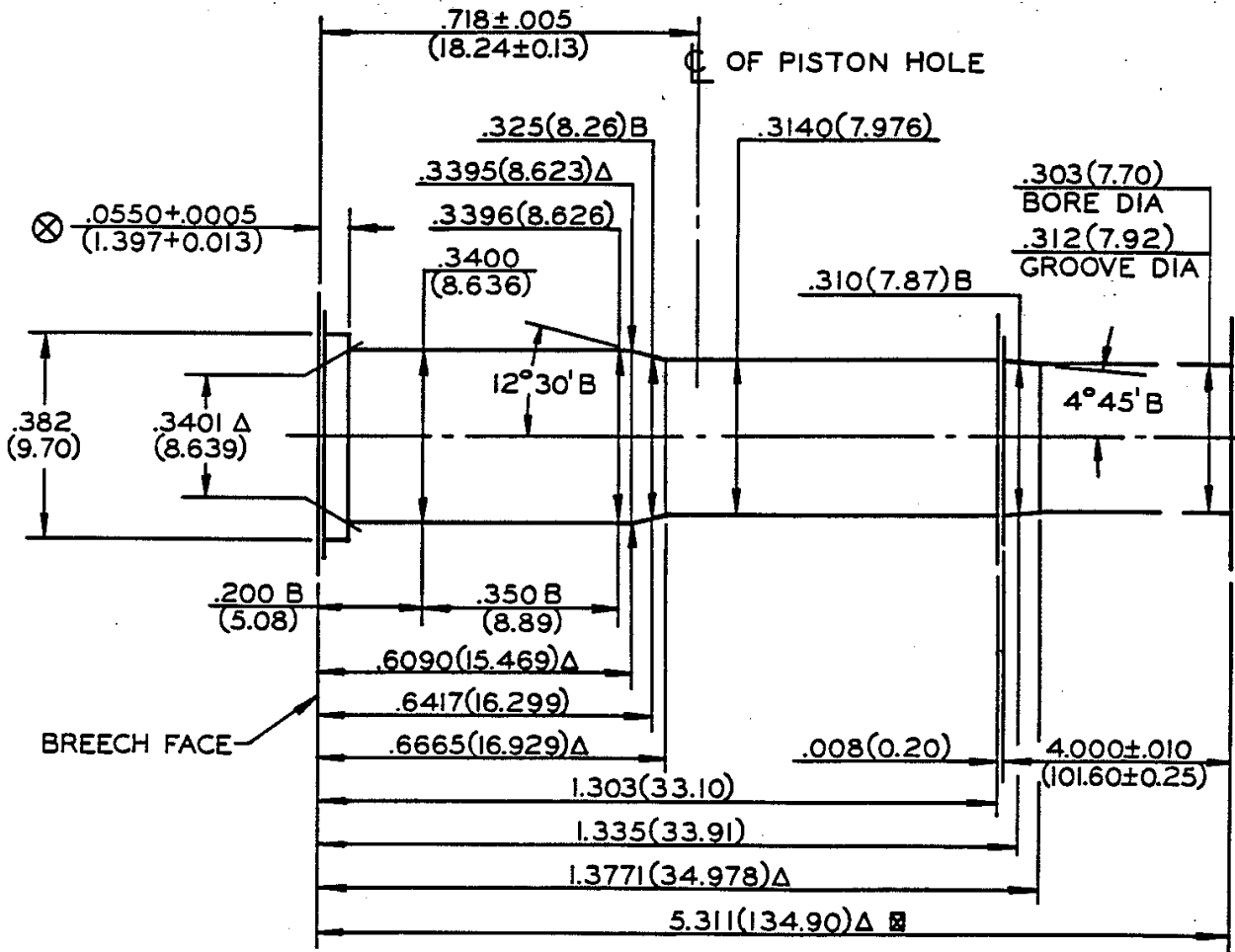
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

⊗=HEADSPACE DIMENSION

Δ=REFERENCE DIMENSION

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

STANDARD VELOCITY AND  
PRESSURE BARREL  
32 SMITH & WESSON



NO. OF GROOVES 5  
WIDTH OF GROOVES .095±.002 (2.41±0.05)  
TWIST 18.75 (476.3) RH  
DIA OF PISTON HOLE .206 (5.23)

☒ ALTERNATE ONE PIECE BARREL LENGTH 3.910±.010 (99.31±0.25)

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

UNLESS OTHERWISE NOTED  
ALL DIA +.0005 (0.013)  
LENGTH TOL +.005 (0.13)

**NOTE**

B=BASIC

(XX.XX)=MILLIMETERS

\* DIMENSIONS ARE TO INTERSECTION OF LINES

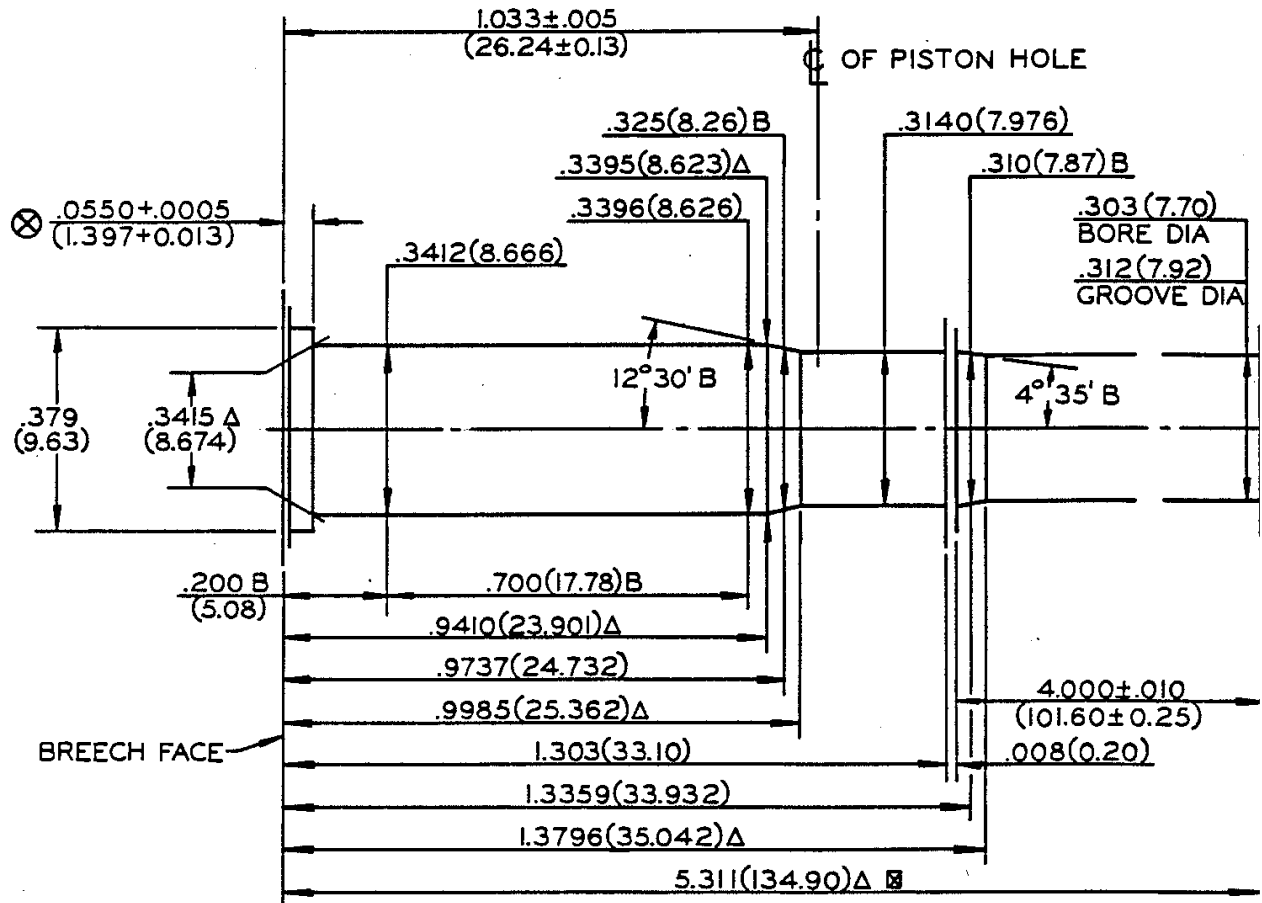
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

⊗=HEADSPACE DIMENSION

Δ=REFERENCE DIMENSION

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

STANDARD VELOCITY AND  
PRESSURE BARREL  
32 SMITH & WESSON LONG  
32 COLT NEW POLICE



NO. OF GROOVES 5  
WIDTH OF GROOVES .095 ± .002 (2.41 ± 0.05)  
TWIST 18.75 (476.3) LH  
DIA OF PISTON HOLE .206 (5.23)

☒ ALTERNATE ONE PIECE BARREL LENGTH 5.320 ± .010 (135.13 ± 0.25)

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

**NOTE**

B=BASIC

(XX.XX)=MILLIMETERS

\* DIMENSIONS ARE TO INTERSECTION OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

UNLESS OTHERWISE NOTED

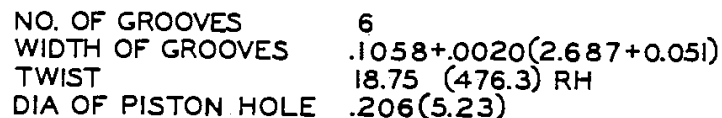
ALL DIA +.0005 (0.013)

LENGTH TOL +.005 (0.13)

⊗=HEADSPACE DIMENSION

Δ=REFERENCE DIMENSION

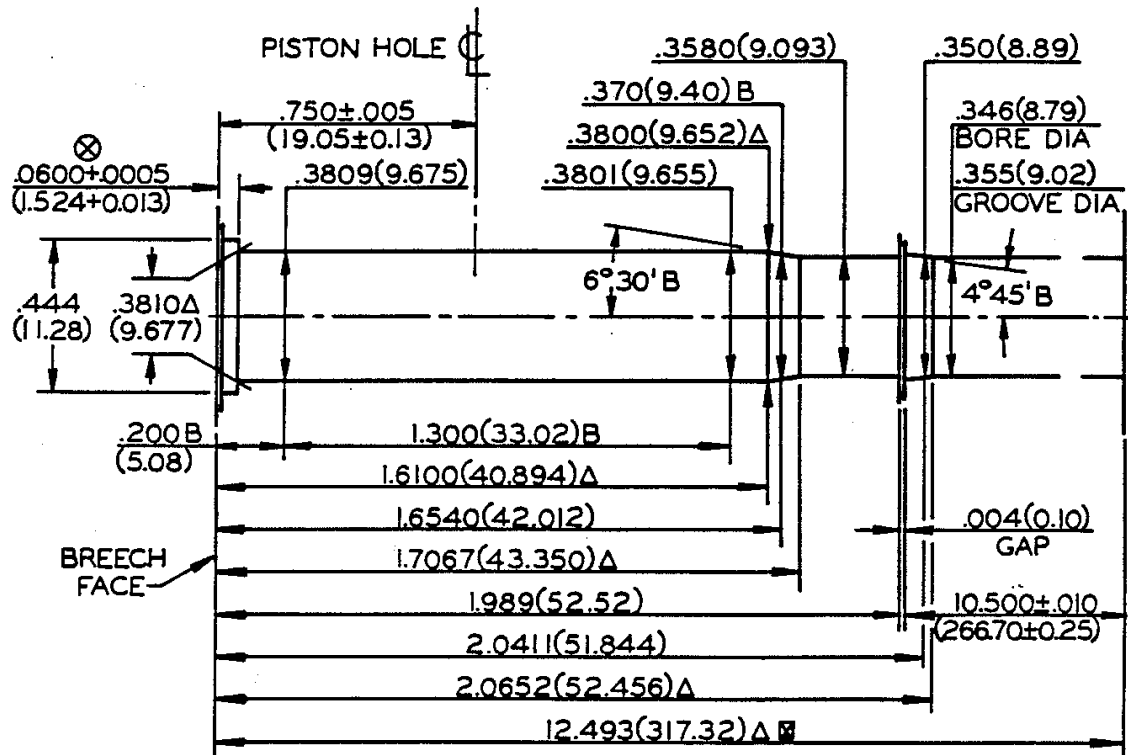
STANDARD VELOCITY AND  
PRESSURE BARREL  
357 MAGNUM

 $\Delta$  = REFERENCE DIMENSION



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

STANDARD VELOCITY AND  
 PRESSURE BARREL  
 357 REMINGTON MAXIMUM



NO. OF GROOVES 6  
 WIDTH OF GROOVES .1058±.0020(2.687±0.051)  
 TWIST 18.75 (476.3) RH  
 DIA OF PISTON HOLE .206(5.23)

☒ ALTERNATE ONE PIECE BARREL LENGTH 12.493±.010(317.32±0.25)

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

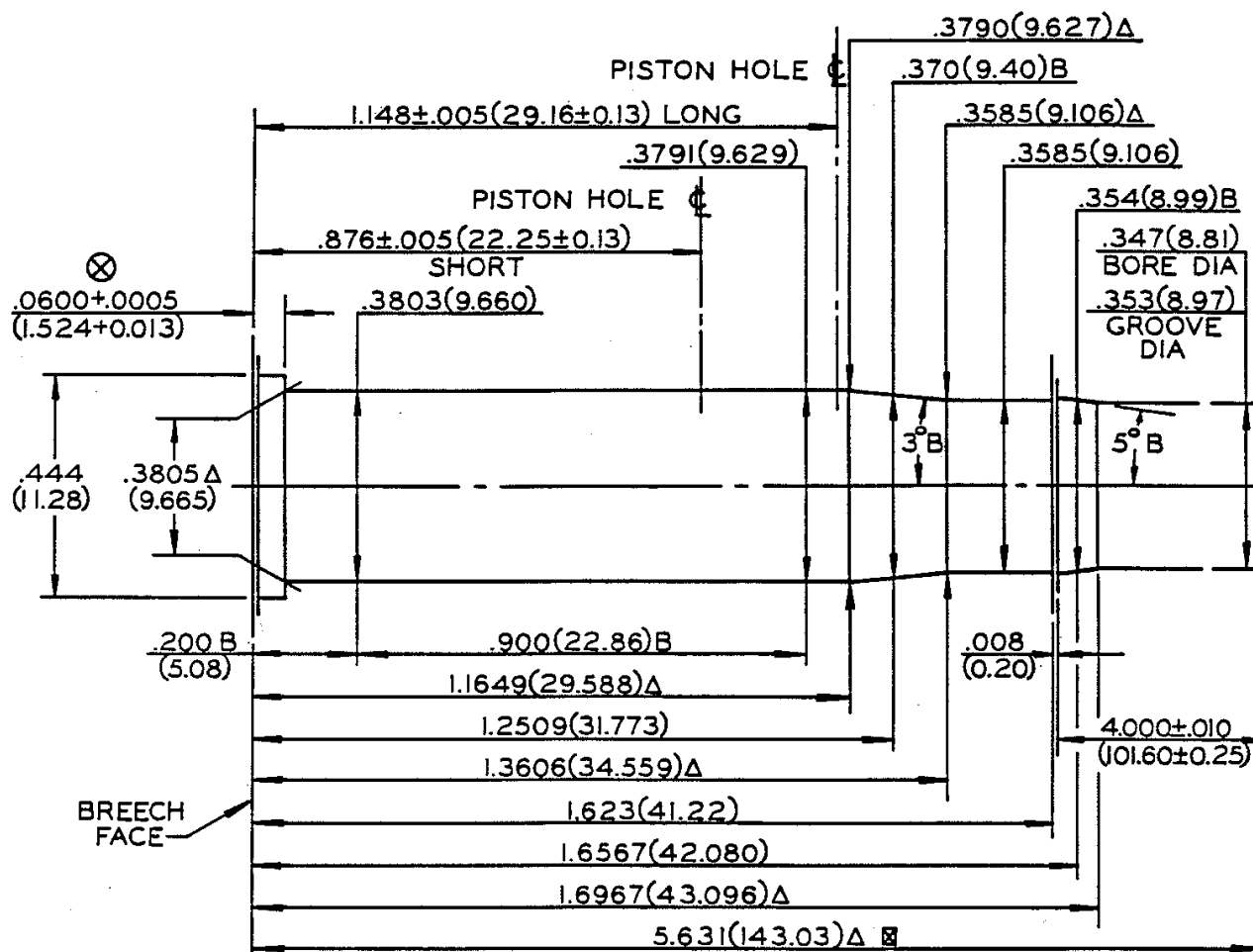
UNLESS OTHERWISE NOTED  
 ALL DIA +.0005(0.013)  
 LENGTH TOL +.005(0.13)

**NOTE**

B = BASIC Δ = REFERENCE DIMENSION ⊗ = HEADSPACE DIMENSION  
 \* DIMENSIONS ARE TO INTERSECTION 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 AND  
PRESSURE BARREL  
38 LONG COLT  
38 SHORT COLT



NO. OF GROOVES 6  
WIDTH OF GROOVES  $.120 \pm .002$  (3.05  $\pm$  0.05)  
TWIST 16 (406.4) LH  
DIA OF PISTON HOLE  $.206$  (5.23)

$\boxtimes$  ALTERNATE ONE PIECE BARREL LENGTH  $7.410 \pm .010$  (188.21  $\pm$  0.25)  
LAND AND GROOVE DIMENSIONS TO BE WITHIN  
TOLERANCES THROUGHOUT LENGTH OF BARREL

UNLESS OTHERWISE NOTED  
ALL DIA  $+.0005$  (0.013)  
LENGTH TOL  $+.005$  (0.13)

NOTE

B=BASIC

(XX.XX)=MILLIMETERS

\* DIMENSIONS ARE TO INTERSECTION OF LINES

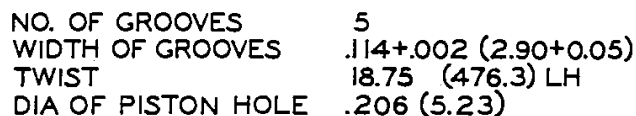
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

$\boxtimes$ =HEADSPACE DIMENSION  
 $\Delta$ =REFERENCE DIMENSION

STANDARD VELOCITY AND  
PRESSURE BARREL

---

38 SMITH & WESSON  
38 COLT NEW POLICE

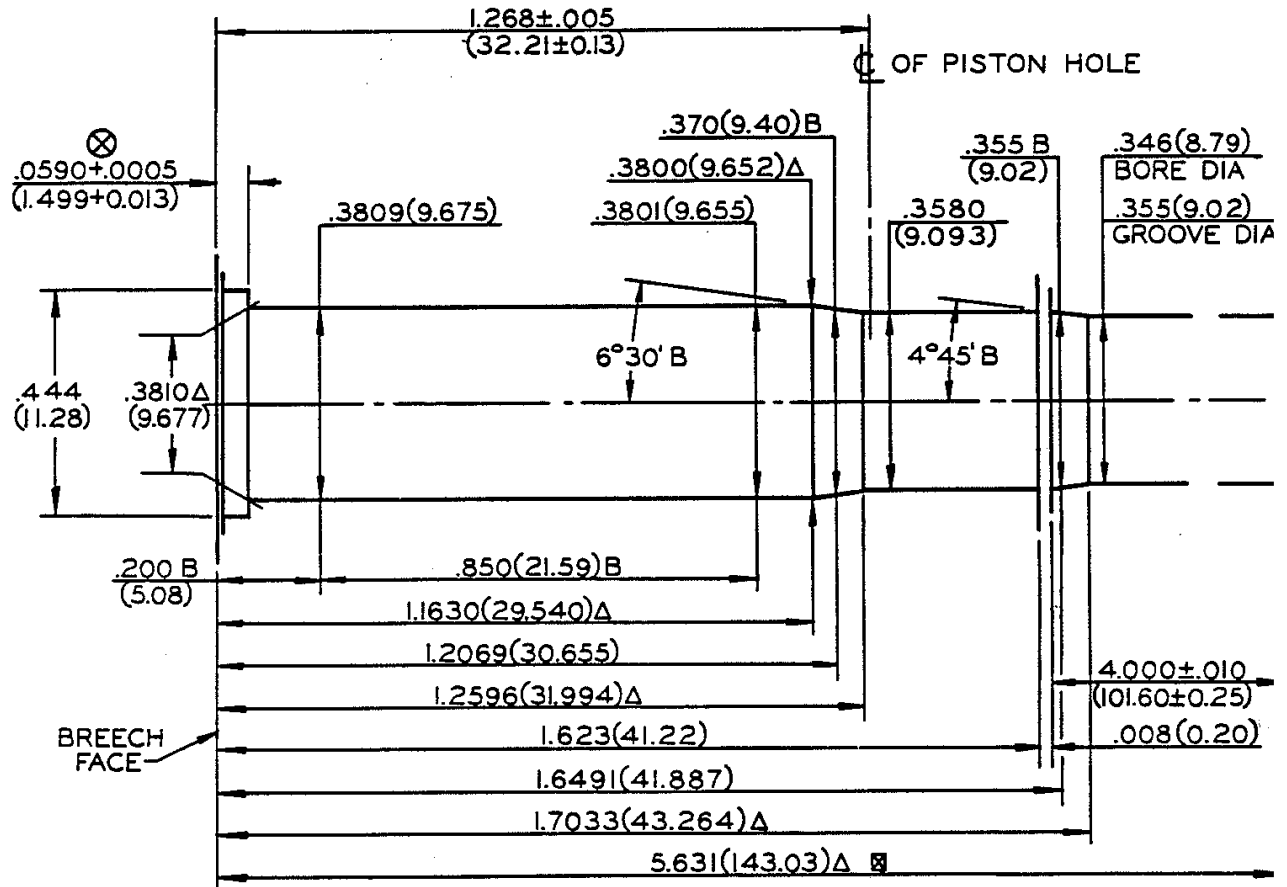


\*. DIMENSIONS ARE TO INTERSECTION OF LINES Δ=REFERENCE DIMENSION  
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

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

STANDARD VELOCITY AND  
PRESSURE BARREL

38 SPECIAL  
38 SPECIAL +P  
38 SPECIAL MATCH



NOTE

B=BASIC

(XX.XX)=MILLIMETERS

\* DIMENSIONS ARE TO INTERSECTION OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

UNLESS OTHERWISE NOTED

ALL DIA +.0005 (0.013)

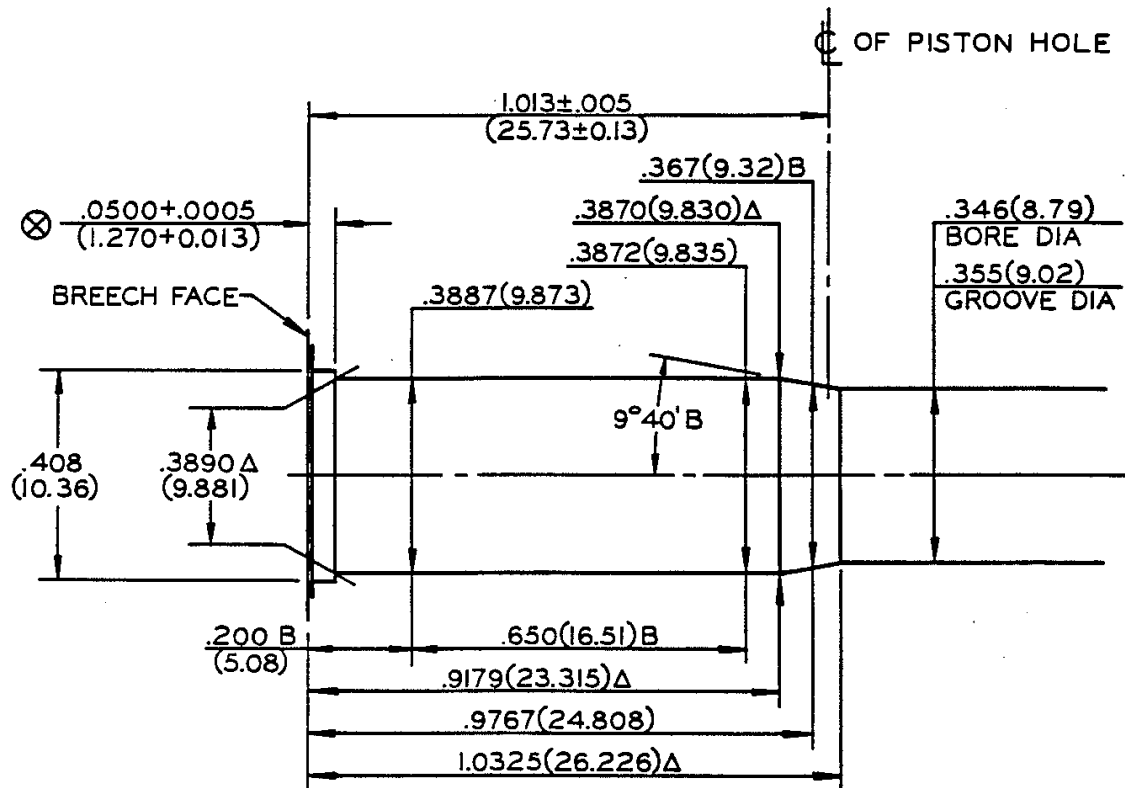
LENGTH TOL +.005 (0.13)

⊗=HEADSPACE DIMENSION

Δ=REFERENCE DIMENSION

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

STANDARD VELOCITY AND  
 PRESSURE BARREL  
 38 SUPER AUTOMATIC +P  
 38 AUTO



NO. OF GROOVES 6  
 WIDTH OF GROOVES .121±0.002 (3.07±0.05)  
 TWIST 16 (406.4) LH  
 LENGTH OF BARREL 5.000±0.010 (127.00±0.25)  
 DIA OF PISTON HOLE .206 (5.23)

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

UNLESS OTHERWISE NOTED  
 ALL DIA +.0005 (0.013)  
 LENGTH TOL +.005 (0.13)

**NOTE**

B = BASIC

(XX.XX) = MILLIMETERS

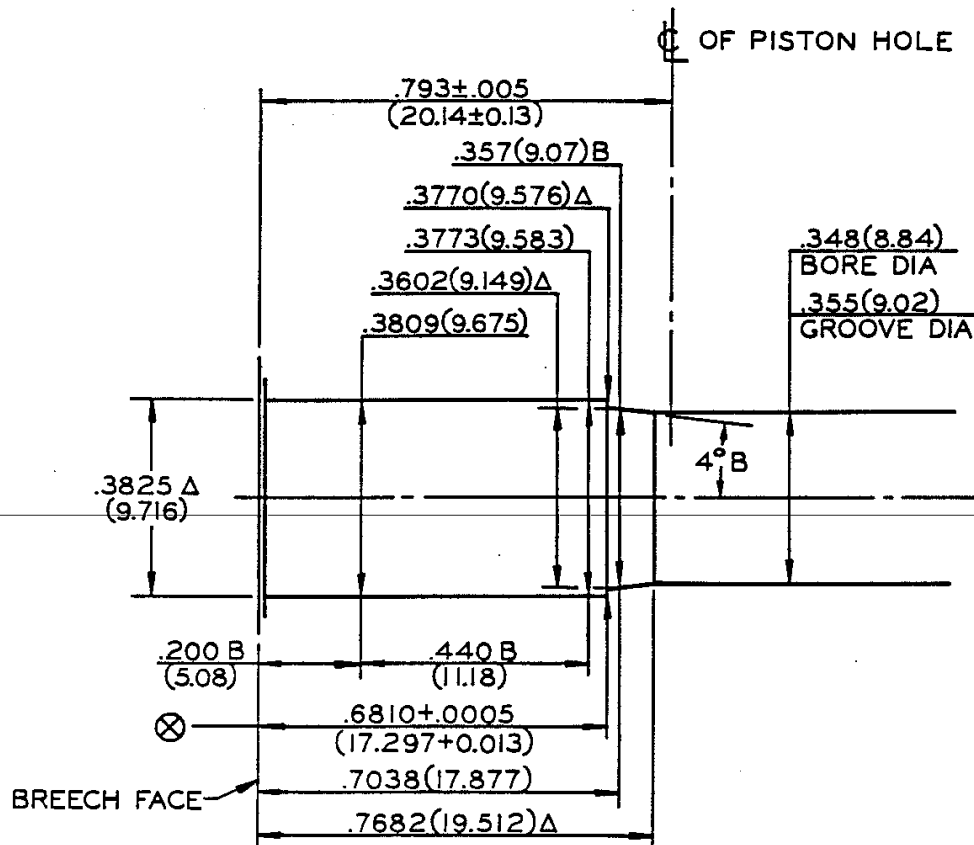
\* DIMENSIONS ARE TO INTERSECTION OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

⊗ = HEADSPACE DIMENSION  
 Δ = REFERENCE DIMENSION

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

STANDARD VELOCITY AND  
 PRESSURE BARREL  
 380 AUTOMATIC



NO. OF GROOVES	6
WIDTH OF GROOVES	.121±.002 (3.07±0.05)
TWIST	16 (406.4) LH
LENGTH OF BARREL	3.750±.010 (95.25±0.25)
DIA OF PISTON HOLE	.206 (5.23)

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

UNLESS OTHERWISE NOTED  
 ALL DIA +.0005(0.013)  
 LENGTH TOL +.005(0.13)

**NOTE**

B=BASIC

(XX.XX)=MILLIMETERS

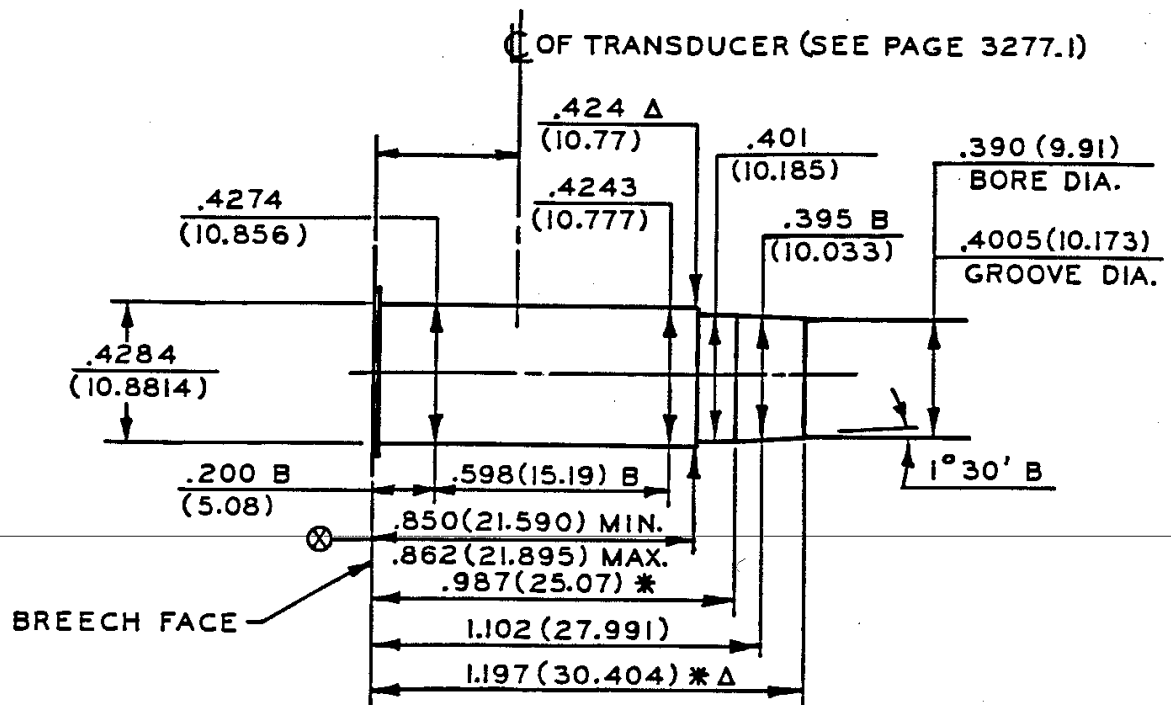
\* DIMENSIONS ARE TO INTERSECTION OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

⊗=HEADSPACE DIMENSION  
 Δ=REFERENCE DIMENSION

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

STANDARD VELOCITY AND  
 PRESSURE BARREL  
 40 SMITH & WESSON



NO. OF GROOVES	6
WIDTH OF GROOVES	.120±.002 (3.05±0.05) WIDE
TWIST	16 (406.4) L.H.
LENGTH OF BARREL	4.000±.010 (101.6±0.25)

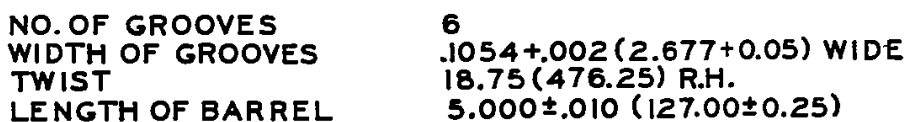
LAND AND GROOVE DIMENSIONS TO BE WITHIN  
 TOLERANCES THROUGHOUT LENGTH OF BARREL

UNLESS OTHERWISE NOTED  
 ALL DIA. +.0005 (0.013)  
 LENGTH TOL. +.005 (0.13)

**NOTE**

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

STANDARD VELOCITY AND  
PRESSURE BARREL  
41 ACTION EXPRESS



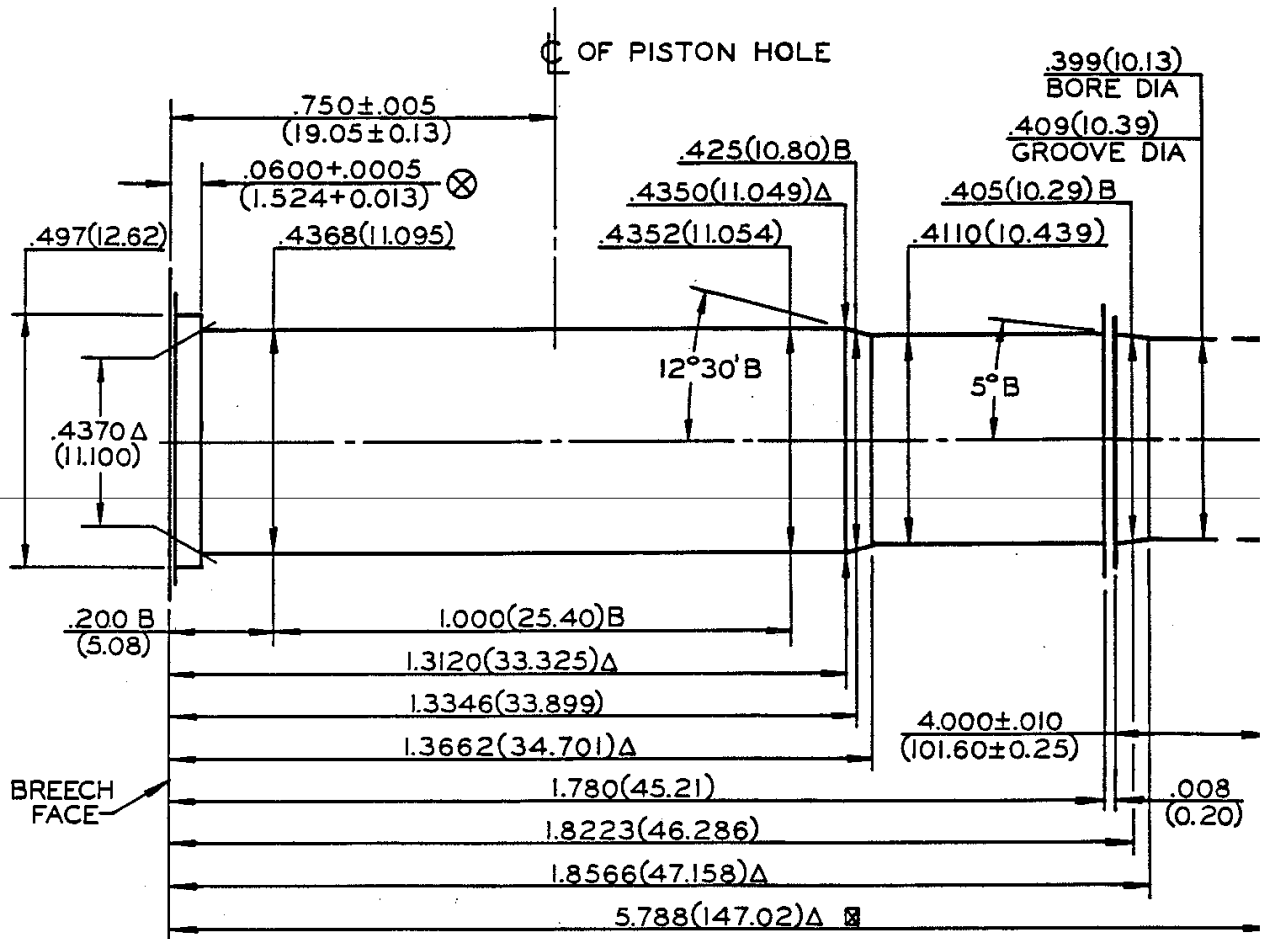
UNLESS OTHERWISE NOTED  
ALL DIA.+.0005 (0.013)  
LENGTH OF TOL.+.005 (0.13)

## 128



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

STANDARD VELOCITY AND  
PRESSURE BARREL  
41 REMINGTON MAGNUM



NO. OF GROOVES 6  
WIDTH OF GROOVES .1054+0.0020(2.677+0.051)  
TWIST 18.75 (476.3) RH  
DIA OF PISTON HOLE .206 (5.23)

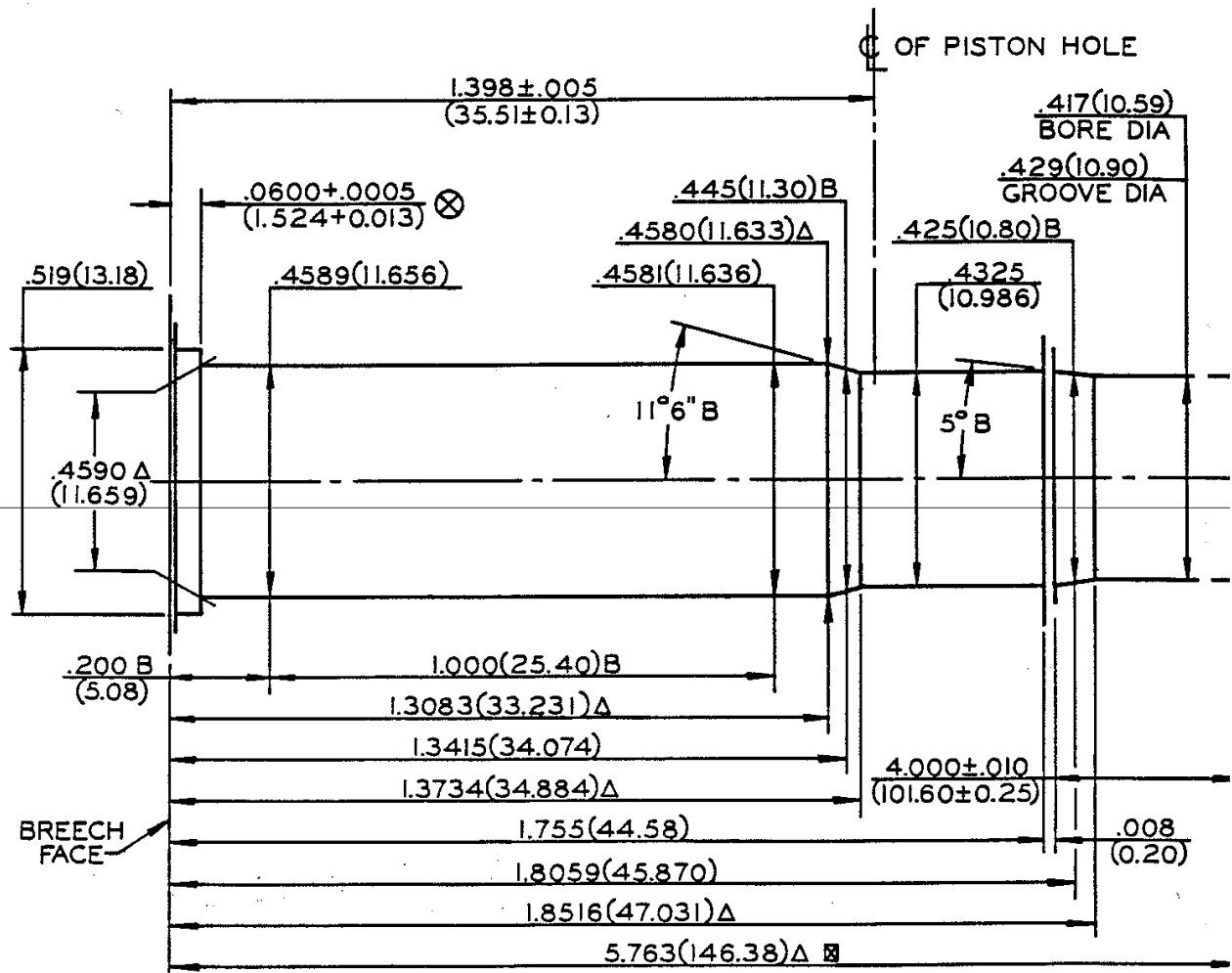
☒ ALTERNATE ONE PIECE BARREL LENGTH 10.135±.010(257.43±0.25)

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

NOTE UNLESS OTHERWISE NOTED  
B=BASIC ALL DIA +.0005(0.013)  
(XX.XX)=MILLIMETERS LENGTH TOL +.005(0.13) ☒=HEADSPACE DIMENSION  
\* DIMENSIONS ARE TO INTERSECTION OF LINES Δ=REFERENCE DIMENSION  
ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

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

STANDARD VELOCITY AND  
PRESSURE BARREL  
44 REMINGTON MAGNUM



NO. OF GROOVES 6  
WIDTH OF GROOVES .1076+.0020(2.733+0.051)  
TWIST 20 (508) RH  
DIA OF PISTON HOLE .206(5.23)

☒ ALTERNATE ONE PIECE BARREL LENGTH 8.275±.010(210.19±0.25)

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

NOTE

B=BASIC

(XX.XX)=MILLIMETERS

\* DIMENSIONS ARE TO INTERSECTION OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

UNLESS OTHERWISE NOTED

ALL DIA +.0005(0.013)

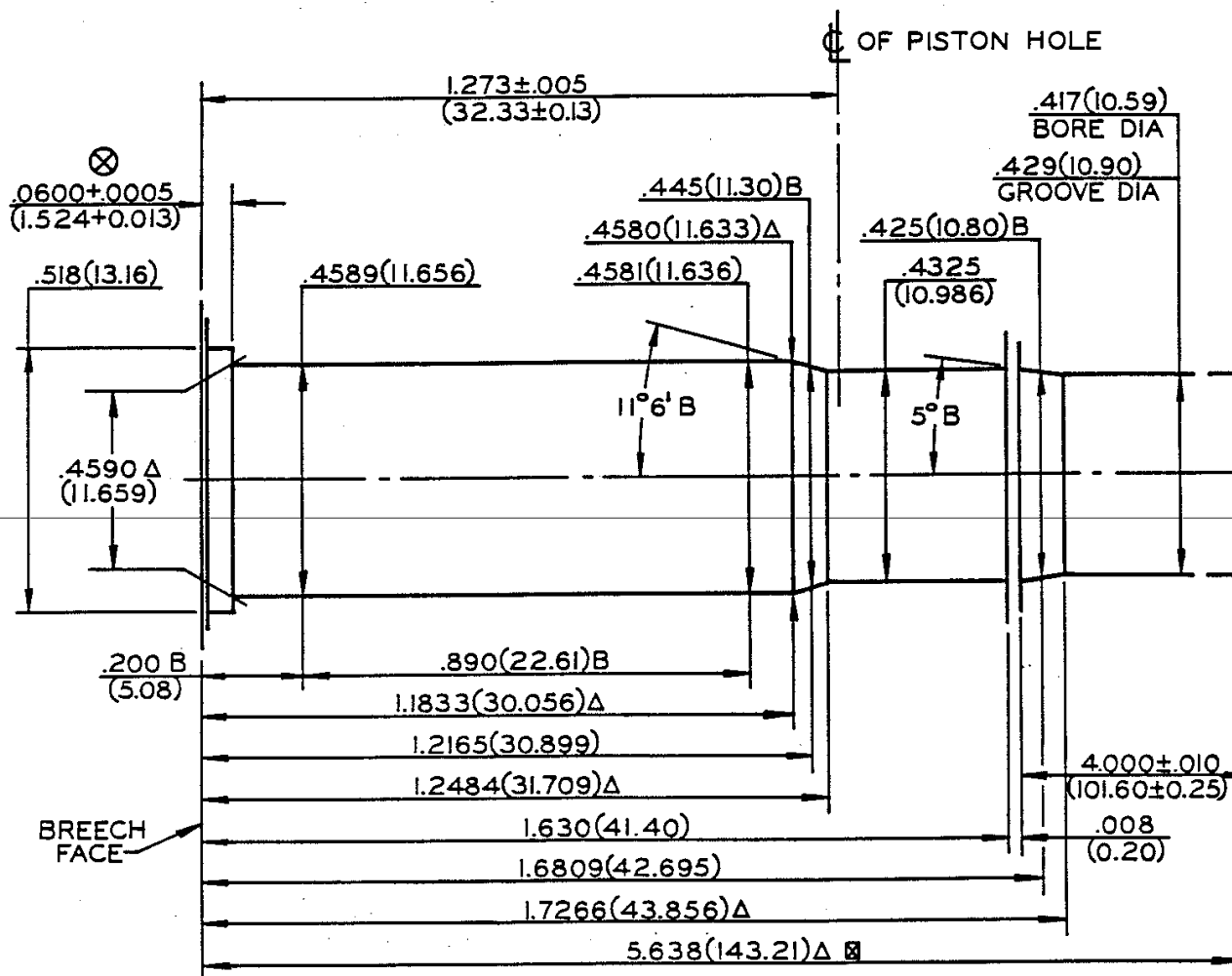
LENGTH TOL +.005(0.13)

⊗=HEADSPACE DIMENSION

Δ=REFERENCE DIMENSION

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

STANDARD VELOCITY AND  
PRESSURE BARREL  
44 SMITH & WESSON SPECIAL



NO. OF GROOVES 5  
WIDTH OF GROOVES .1285 ± .0020 (3.264 ± 0.051)  
TWIST 20 (508) RH  
DIA OF PISTON HOLE .206 (5.23)

☒ ALTERNATE ONE PIECE BARREL LENGTH 8.150 ± 0.010 (207.01 ± 0.25)

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

**NOTE**

B=BASIC

(XX.XX)=MILLIMETERS

\* DIMENSIONS ARE TO INTERSECTION OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

UNLESS OTHERWISE NOTED

ALL DIA +.0005 (0.013)

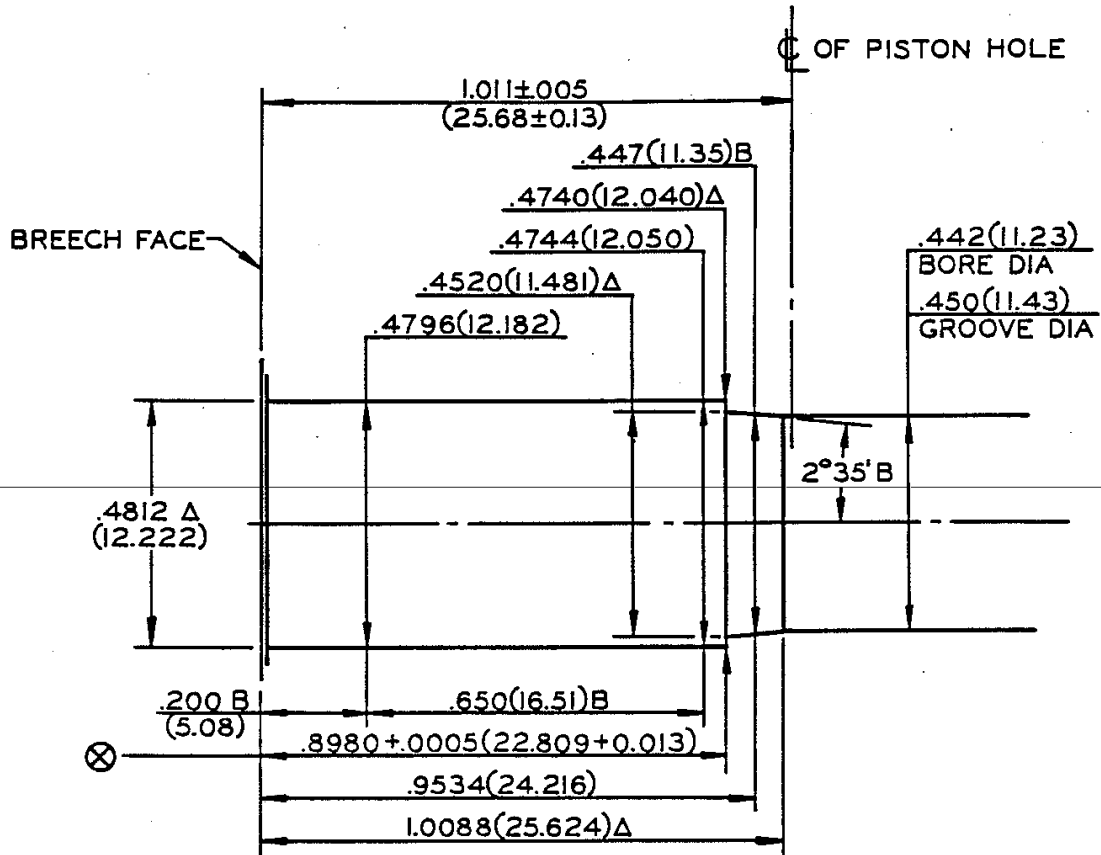
LENGTH TOL +.005 (0.13)

⊗=HEADSPACE DIMENSION

Δ=REFERENCE DIMENSION

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

STANDARD VELOCITY AND  
 PRESSURE BARREL  
 45 AUTOMATIC  
 45 AUTOMATIC+P



NO. OF GROOVES	6
WIDTH OF GROOVES	$.147 \pm 0.002$ (3.73 $\pm$ 0.05)
TWIST	16 (406.4) LH
LENGTH OF BARREL	$5.000 \pm 0.010$ (127.00 $\pm$ 0.25)
DIA OF PISTON HOLE	$.206$ (5.23)

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

UNLESS OTHERWISE NOTED  
 ALL DIA  $+0.0005$  (0.013)  
 LENGTH TOL  $+0.005$  (0.13)

**NOTE**

B=BASIC

(XX.XX)=MILLIMETERS

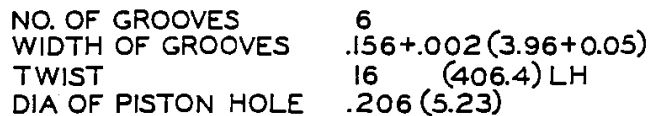
\* DIMENSIONS ARE TO INTERSECTION OF LINES

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

⊗=HEADSPACE DIMENSION

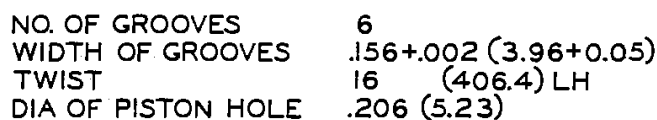
Δ=REFERENCE DIMENSION

STANDARD VELOCITY AND  
PRESSURE BARREL  
45 AUTOMATIC RIM



⊗=HEADSPACE DIMENSION  
Δ=REFERENCE DIMENSION  
CONDITION (MMC)

STANDARD VELOCITY AND  
PRESSURE BARREL  
45 COLT



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

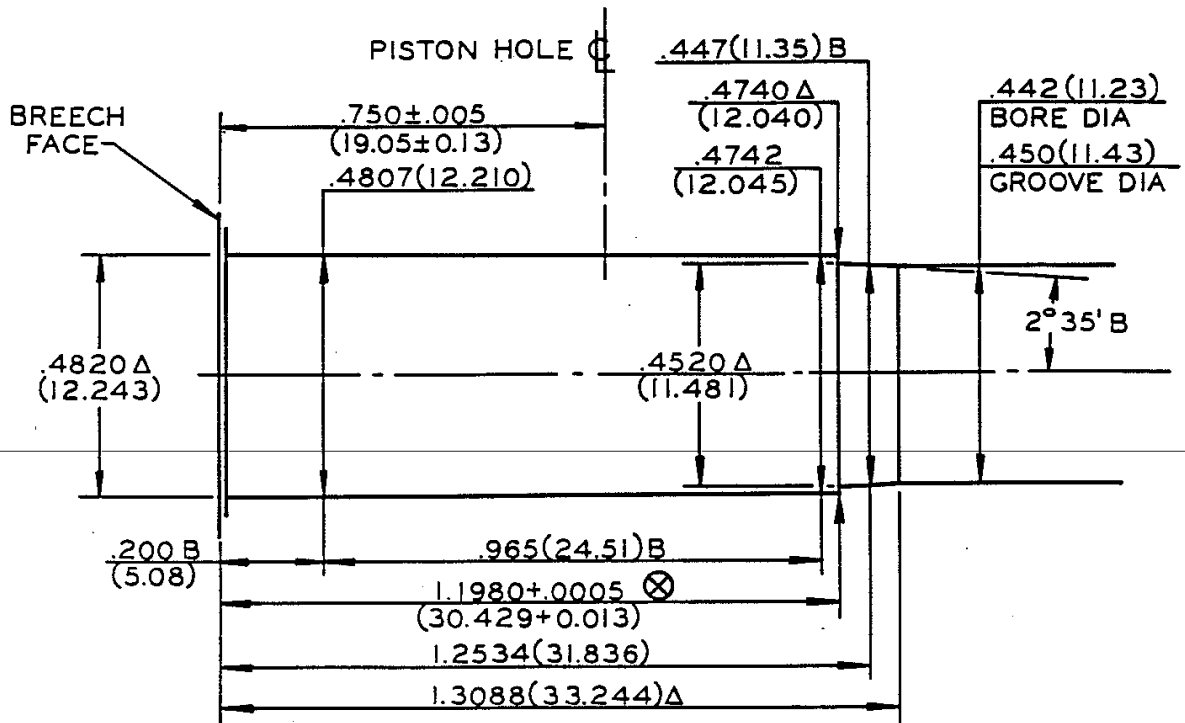
UNLESS OTHERWISE NOTED  
ALL DIA +.0005(0.013)  
LENGTH TOL +.005(0.13)

⊗=HEADSPACE DIMENSION

ALL CALCULATIONS APPLY AT MAXIMUM MATERIAL CONDITION (MMC)

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

STANDARD VELOCITY AND  
 PRESSURE BARREL  
 45 WINCHESTER MAGNUM



NO. OF GROOVES 6  
 WIDTH OF GROOVES .147 ± .002(3.73 ± 0.05)  
 TWIST 16(406.4) LH  
 LENGTH OF BARREL 5.000 ± .010(127.00 ± 0.25)  
 DIA OF PISTON HOLE .206(5.23)

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

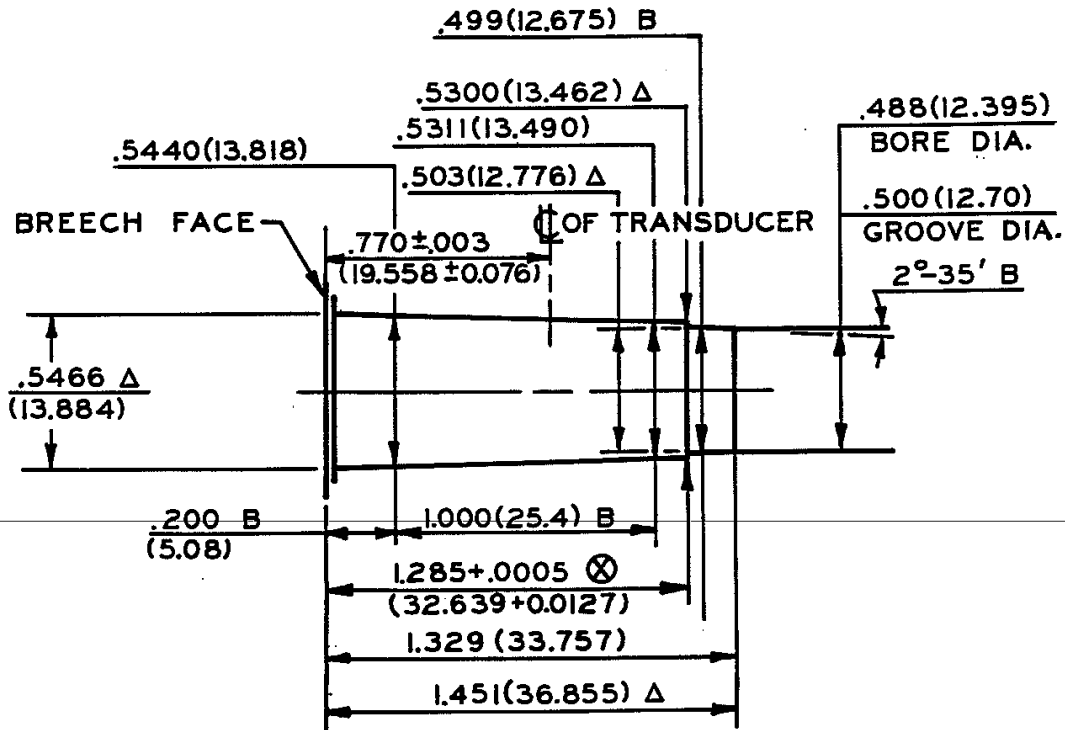
UNLESS OTHERWISE NOTED  
 ALL DIA +.0005(0.013)  
 LENGTH TOL +.005(0.13)

**NOTE**

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

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

STANDARD VELOCITY AND  
 PRESSURE BARREL  
 50 ACTION EXPRESS



NO. OF GROOVES	6
WIDTH OF GROOVES	$.120 \pm .002 (3.05 \pm 0.05)$ WIDE
TWIST	20(508.0) R.H.
LENGTH OF BARREL	$6.000 \pm .010 (152.40 \pm 0.25)$

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

UNLESS OTHERWISE NOTED  
 ALL DIA.  $+.0005 (0.013)$   
 LENGTH OF TOL.  $+.005 (0.13)$

**NOTE**

B=BASIC  
 (XX.XX)=MILLIMETERS  
 $\otimes$ =HEADSPACE DIMENSION  
 $\Delta$ =REFERENCE DIMENSION  
 \* DIMENSIONS ARE TO INTERSECTION OF LINES  
 ALL CALCULATIONS APPLY AT MAXIMUM  
 MATERIAL CONDITION (M.M.C.)



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

USAGE OF CRUSHER CYLINDER  
PRESSURE TESTS

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 precompressed before using.

A sample tarage table is shown on page 135, but only the tarage table furnished with the particular lot of crushers should be used.

SIZE DESIGNATION	NOMINAL SIZE	PISTON		AVERAGE PRESSURE LIMITS (CUP) IN UNITS OF 100
		DIAMETER	AREA	
A	.146" x .400"	.146"	1/60 sq. inch	Below 350
B	.225" x .500"	.146"	1/60 sq. inch	350 & over
A	.146" x .400"	.206"	1/30 sq. inch	Below 240
B	.225" x .500"	.206"	1/30 sq. inch	240 to 550
C	.225" x .400"	.206"	1/30 sq. inch	Over 550

It is recommended that pressures be recorded in Copper Units of Pressure\*

\*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 have shown that pressures recorded by deformation of copper crusher cylinders are not necessarily a true measure of pounds per square inch for the transient phenomena encountered in sporting arms ammunition.

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

SAMPLE TARAGE TABLE  
.225 x .500 COPPER  
SIZE B

SAMPLE TARAGE TABLE  
COPPER CRUSHER CYLINDERS  
0.225 INCH DIAMETER, 0.500 INCH LONG  
FOR USE WITH 0.206 INCH DIAMETER PISTON  
AREA = 1/30 SQUARE INCH

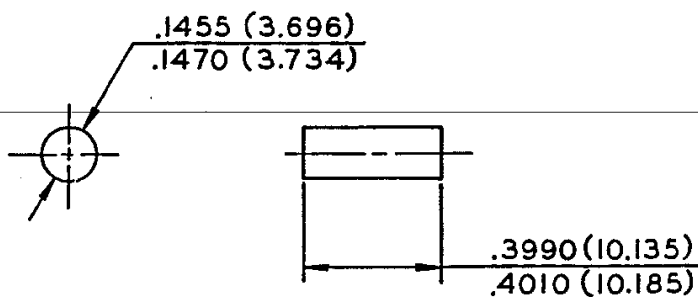
CUP\* in units of 100

Final Length	Pressure CUP*	Final Length	Pressure CUP*	Final Length	Pressure CUP*	Final Length	Pressure CUP*
.499	30	.459	319	.419	491	.379	639
.498	49	.458	324	.418	494	.378	642
.497	72	.457	329	.417	498	.377	646
.496	85	.456	334	.416	502	.376	650
.495	93	.455	339	.415	506	.375	654
.494	102	.454	344	.414	510	.374	657
.493	111	.453	349	.413	514	.373	661
.492	119	.452	354	.412	517	.372	664
.491	128	.451	359	.411	521	.371	668
.490	136	.450	364	.410	525	.370	672
<hr/>							
.489	144	.449	369	.409	529	.369	676
.488	151	.448	374	.408	532	.368	679
.487	159	.447	379	.407	536	.367	683
.486	166	.446	384	.406	540	.366	687
.485	172	.445	389	.405	544	.365	691
.484	179	.444	393	.404	548	.364	695
.483	186	.443	397	.403	552	.363	699
.482	192	.442	401	.402	556	.362	702
.481	199	.441	405	.401	560	.361	706
.480	206	.440	409	.400	563	.360	709
<hr/>							
.479	212	.439	413	.399	567	.359	713
.478	217	.438	417	.398	571	.358	717
.477	223	.437	421	.397	575	.357	721
.476	228	.436	425	.396	578	.356	724
.475	234	.435	429	.395	582	.355	728
.474	239	.434	433	.394	585	.354	732
.473	245	.433	437	.393	589	.353	736
.472	250	.432	440	.392	592	.352	740
.471	256	.431	444	.391	596	.351	744
.470	262	.430	448	.390	599	.350	748
<hr/>							
.469	268	.429	452	.389	603	.349	752
.468	273	.428	456	.388	606	.348	756
.467	278	.427	460	.387	610	.347	760
.466	283	.426	463	.386	613	.346	763
.465	288	.425	467	.385	617	.345	767
.464	293	.424	471	.384	621	.344	771
.463	298	.423	475	.383	625	.343	775
.462	303	.422	479	.382	628	.342	779
.461	308	.421	483	.381	632	.341	783
.460	313	.420	487	.380	635	.340	787

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.

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

.146 x .400 CRUSHER CYLINDER  
SIZE A

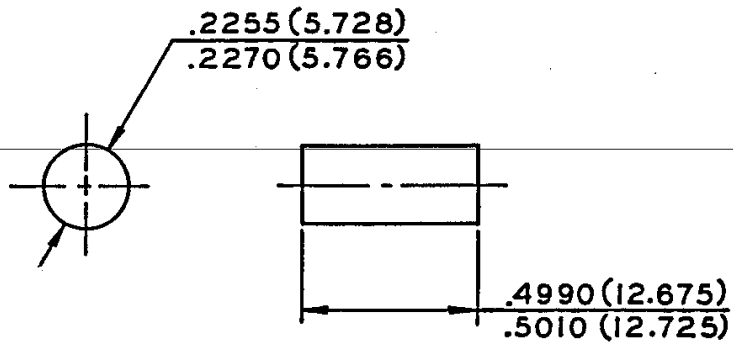


NOTES

1. MATERIAL - COPPER DEVELOPMENT ASSOCIATION ALLOY 102
2. (XX.XX) = MILLIMETERS

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

.225 x .500 CRUSHER CYLINDER  
SIZE B

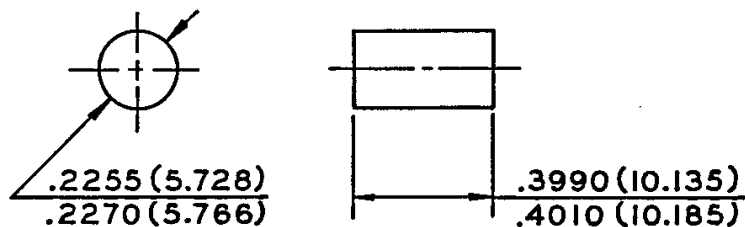


NOTES

1. MATERIAL-COPPER DEVELOPMENT ASSOCIATION ALLOY 102
2. (XX.XX) = MILLIMETERS

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

.225 x .400 CRUSHER CYLINDERS  
SIZE C

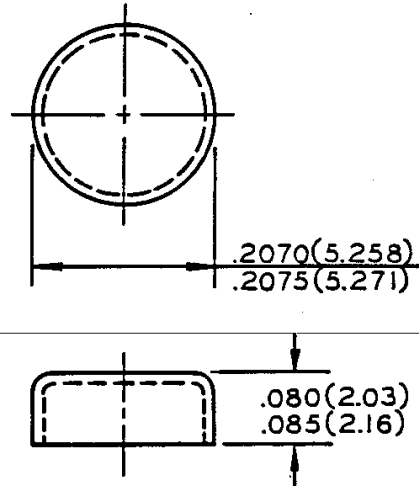
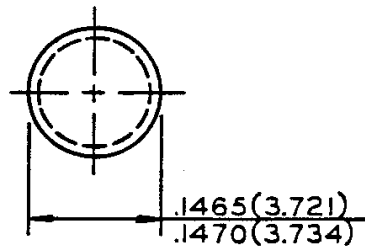


NOTES

1. MATERIAL-COPPER DEVELOPMENT ASSOCIATION ALLOY 102
2. (XX.XX) = MILLIMETERS

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

.146 AND .206 GAS CHECKS



.146 GAS CHECK  
MATERIAL THICKNESS  
.0095-.0105 (0.241-0.267)

.206 GAS CHECK  
MATERIAL THICKNESS  
.0110-.0115 (0.279-0.292)

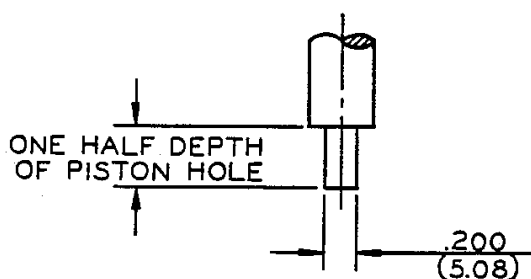
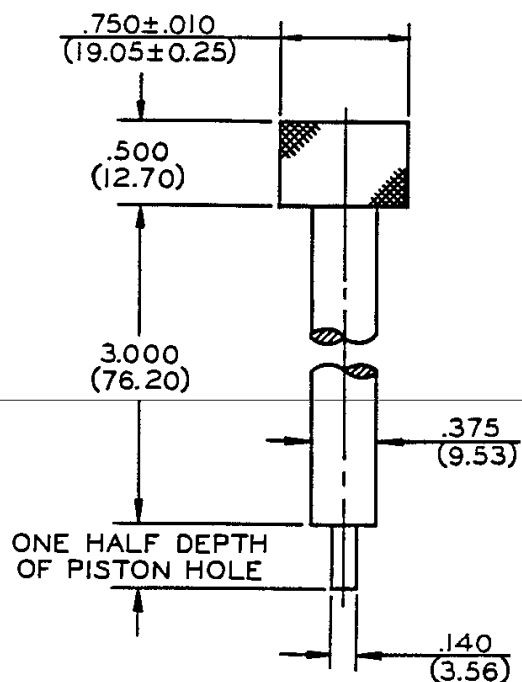
NOTES

1. MATERIAL-COPPER DEVELOPMENT ASSOCIATION ALLOY 210  
GRAIN SIZE-.015-.030 mm
2. (XX.XX) = MILLIMETERS

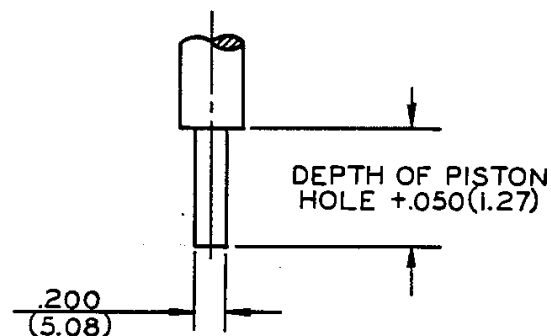
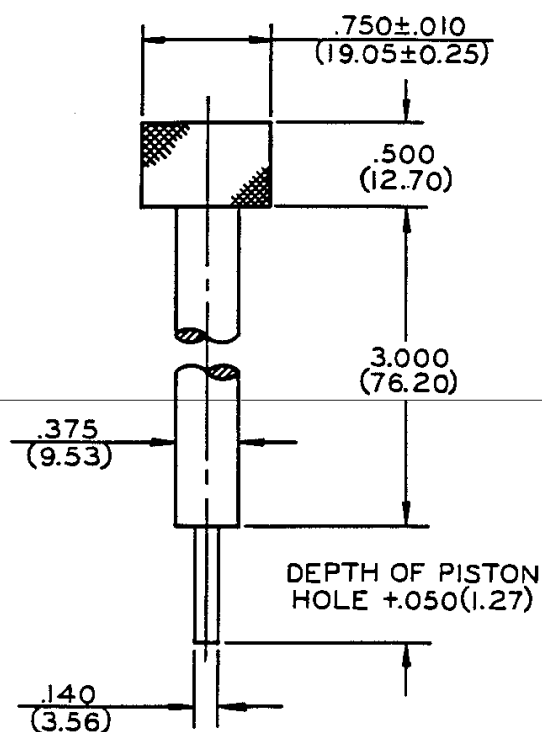
SECTION III - EQUIPMENT  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

GAS CHECK TOOLS  
SEATING AND KNOCKOUT

SEATING TOOL



KNOCKOUT TOOL



NOTES

1. MATERIAL-COPPER DEVELOPMENT ASSOCIATION ALLOY 260
2. UNLESS OTHERWISE NOTED ALL TOLERANCES  $\pm .002(0.05)$
3. (XX.XX) = MILLIMETERS

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

GAS CHECK WAX

INGREDIENTS:

Beeswax	234.0 grams
Paraffin	6.0 grams
Vaseline	6.0 grams
Castor Oil	17.4 grams
Lead Oxide (Red Lead)	72.0 grams
Iron Oxide (Ferric Oxide)	24.0 grams
Rosin	5% by volume

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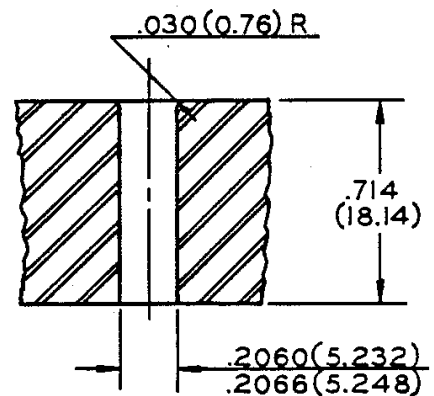
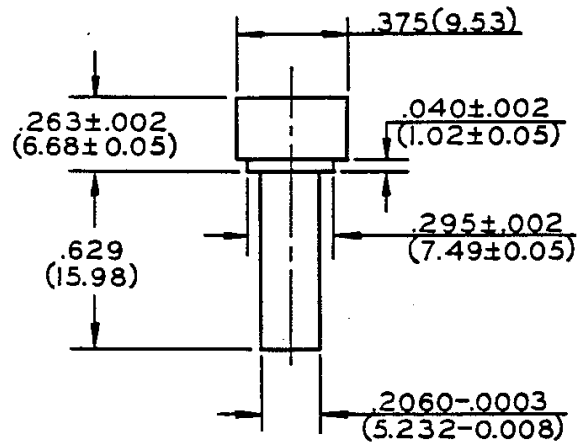
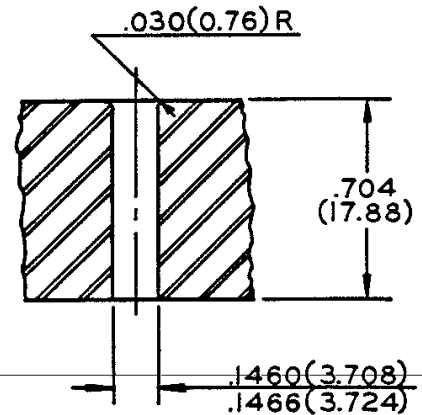
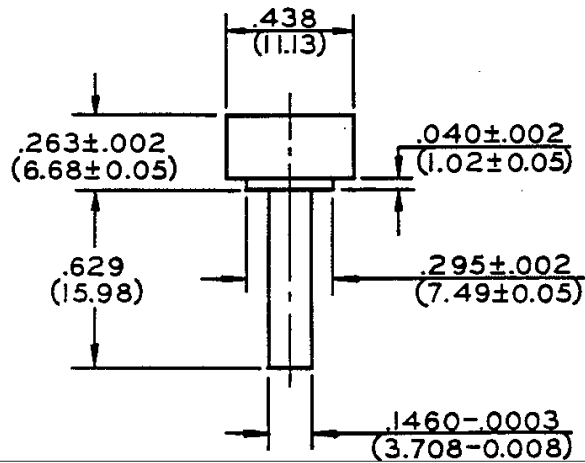
PREPARATION:

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



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

PISTONS & PISTON HOLES



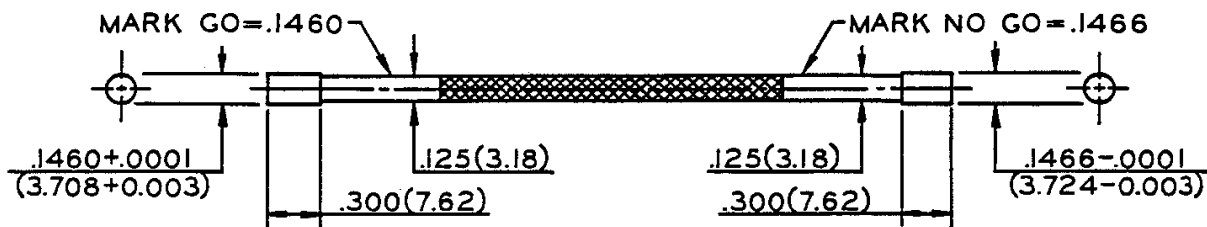
NOTES

1. MATERIAL-HIGH CARBON STEEL-HEAT TREAT R<sub>c</sub> 62-63
2. PISTONS TO BE SUCTION FIT IN PISTON HOLES
3. (XX.XX)=MILLIMETERS

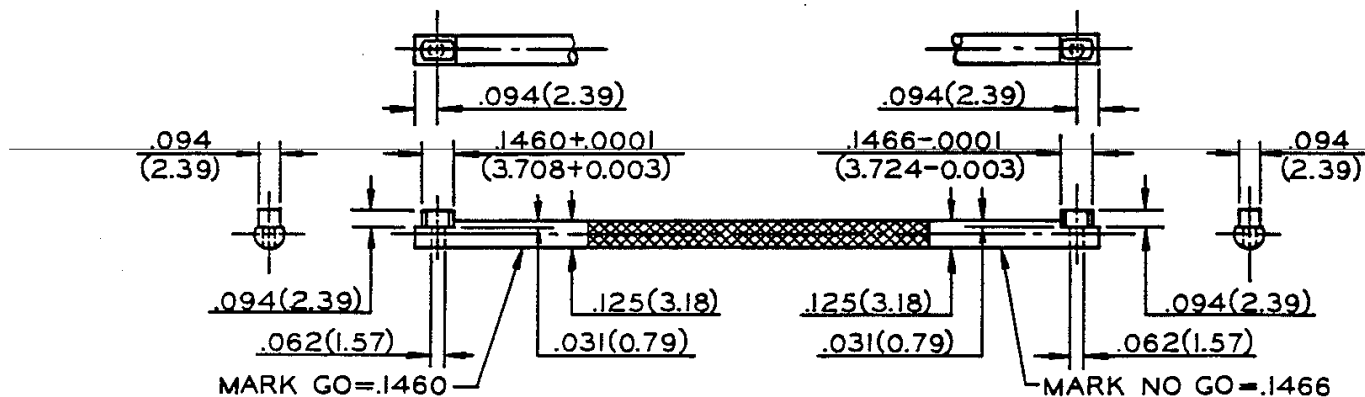
SECTION III - EQUIPMENT  
 CENTERFIRE PISTOL & REVOLVER  
 SAAMI VOLUNTARY PERFORMANCE STANDARDS

PISTON HOLE GAGES

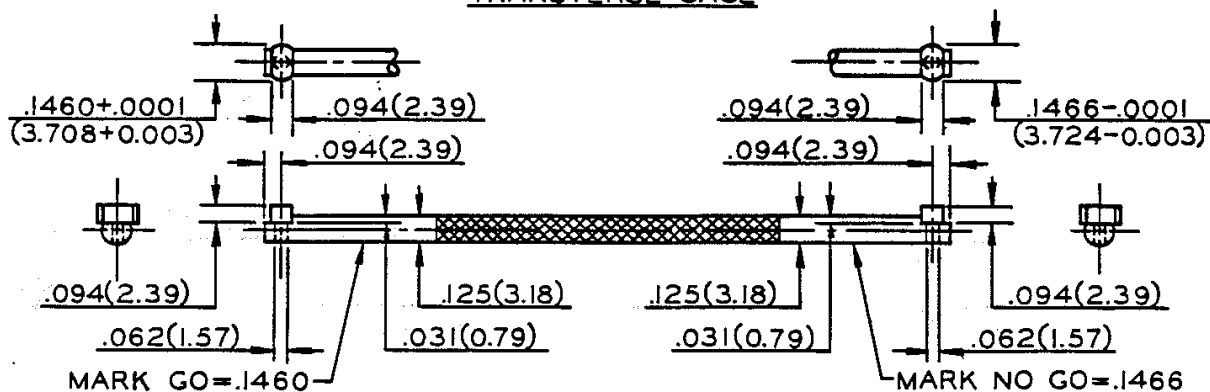
PLUG GAGE



LONGITUDINAL GAGE



TRANSVERSE GAGE



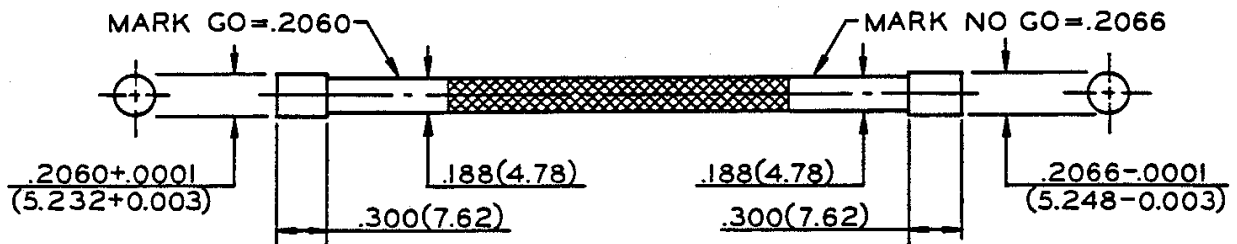
NOTES

1. GENERAL TOLERANCE  $\pm 0.005(0.13)$
2. MATERIAL - OIL HARD DRILL ROD AISI -01 R<sub>c</sub> 61-63
3. (XX.XX) = MILLIMETERS

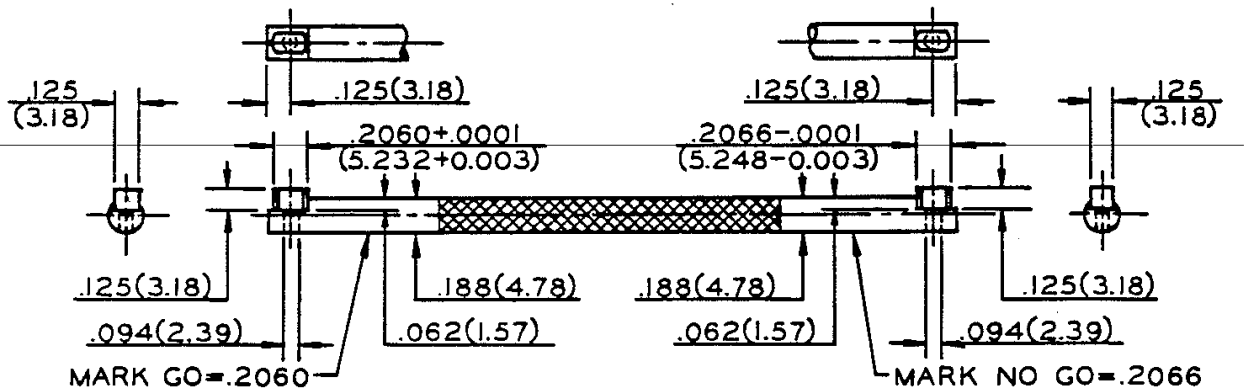
SECTION III - EQUIPMENT  
 CENTERFIRE PISTOL & REVOLVER  
 SAAMI VOLUNTARY PERFORMANCE STANDARDS

PISTON HOLE GAGES

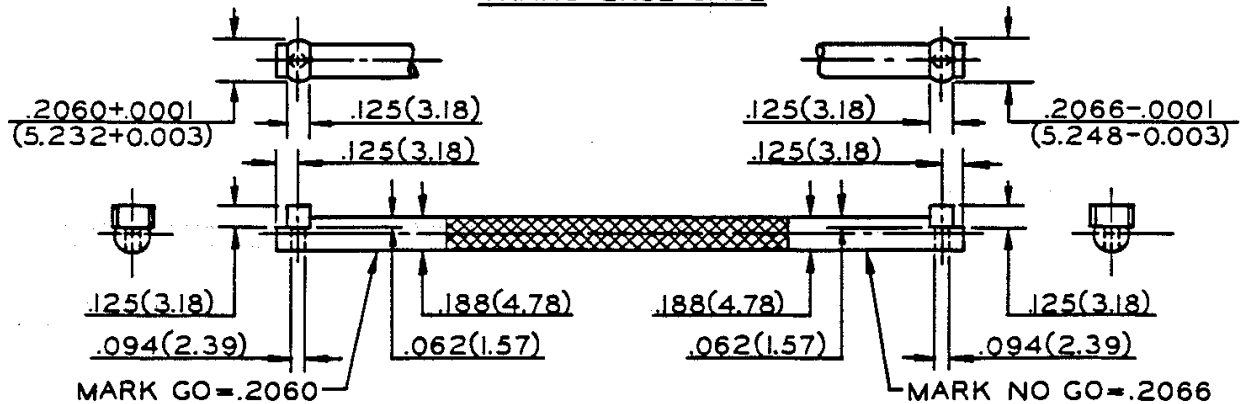
PLUG GAGE



LONGITUDINAL GAGE



TRANSVERSE GAGE



NOTES

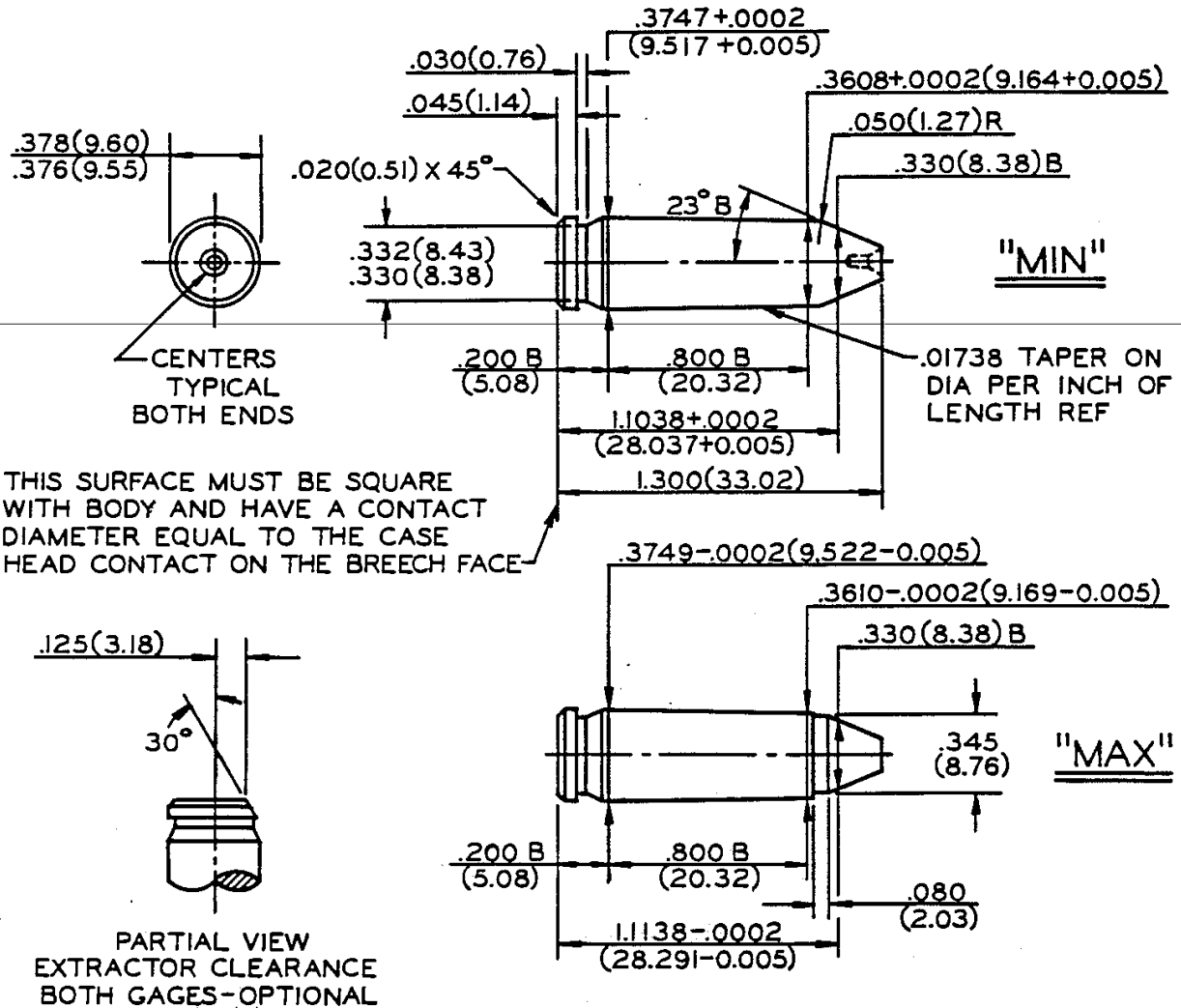
1. GENERAL TOLERANCE  $\pm .005(0.13)$
2. MATERIAL-OIL HARD DRILL ROD AISI  $\sim .01 R_c$  61-63
3. (XX.XX) = MILLIMETERS

### PISTON OIL - PISTON AND GAS CHECK

S.A.E. 30 or equivalent

The oil should be of the non-detergent type meeting the requirements of the S.A.E. "ML" classification.

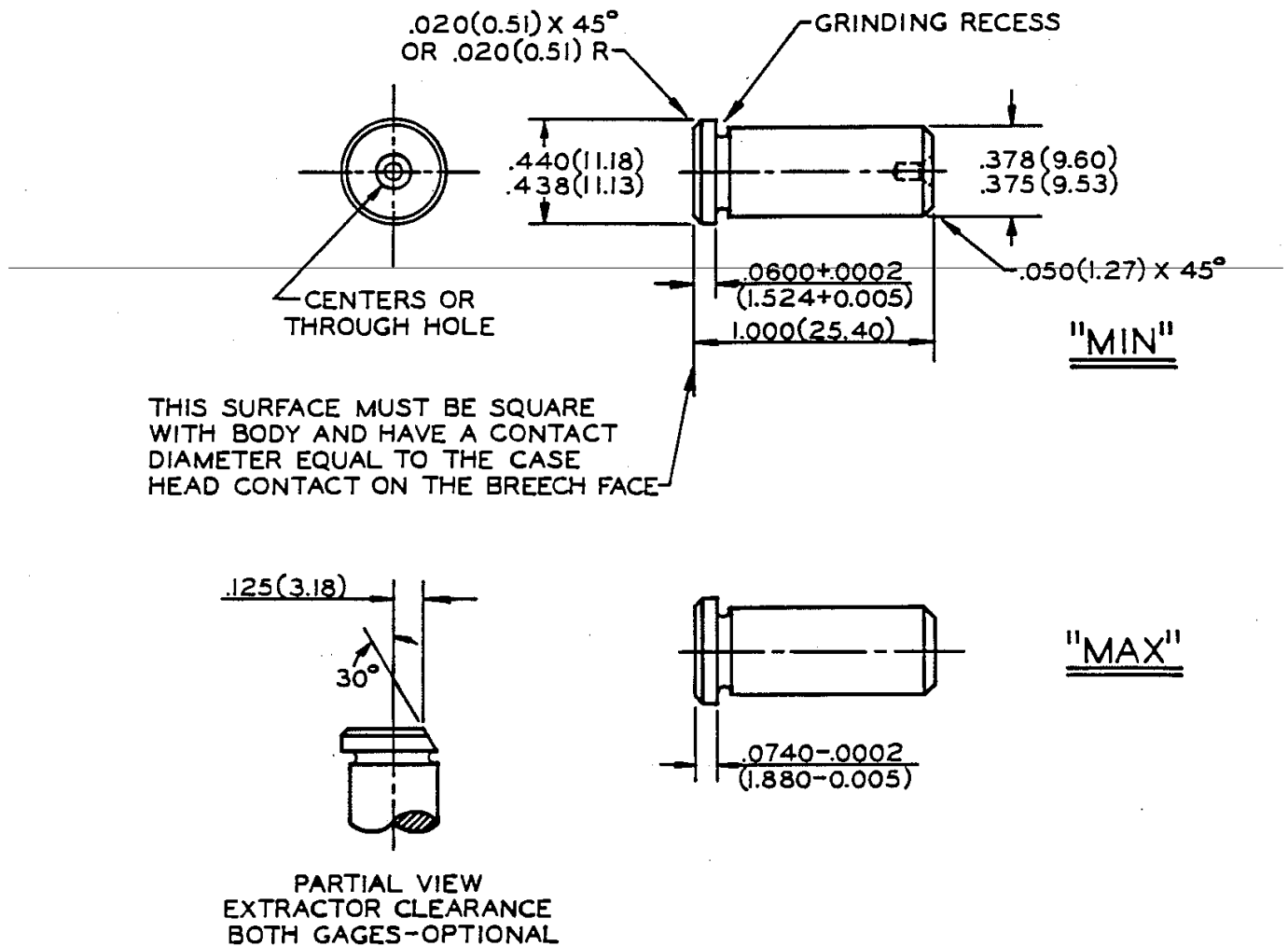
CENTERFIRE PISTOL & REVOLVER  
HEADSPACE GAGES (FIREARMS)  
RIMLESS (TYPICAL)  
 (CALIBER 221 REMINGTON FIREBALL SHOWN)



NOTES  
 B = BASIC  
 (XX.XX) = MILLIMETERS

HARDEN AND GRIND

CENTERFIRE PISTOL & REVOLVER  
HEADSPACE GAGES (FIREARMS)  
 RIMMED (TYPICAL)  
 (CALIBER 38 SPECIAL SHOWN)

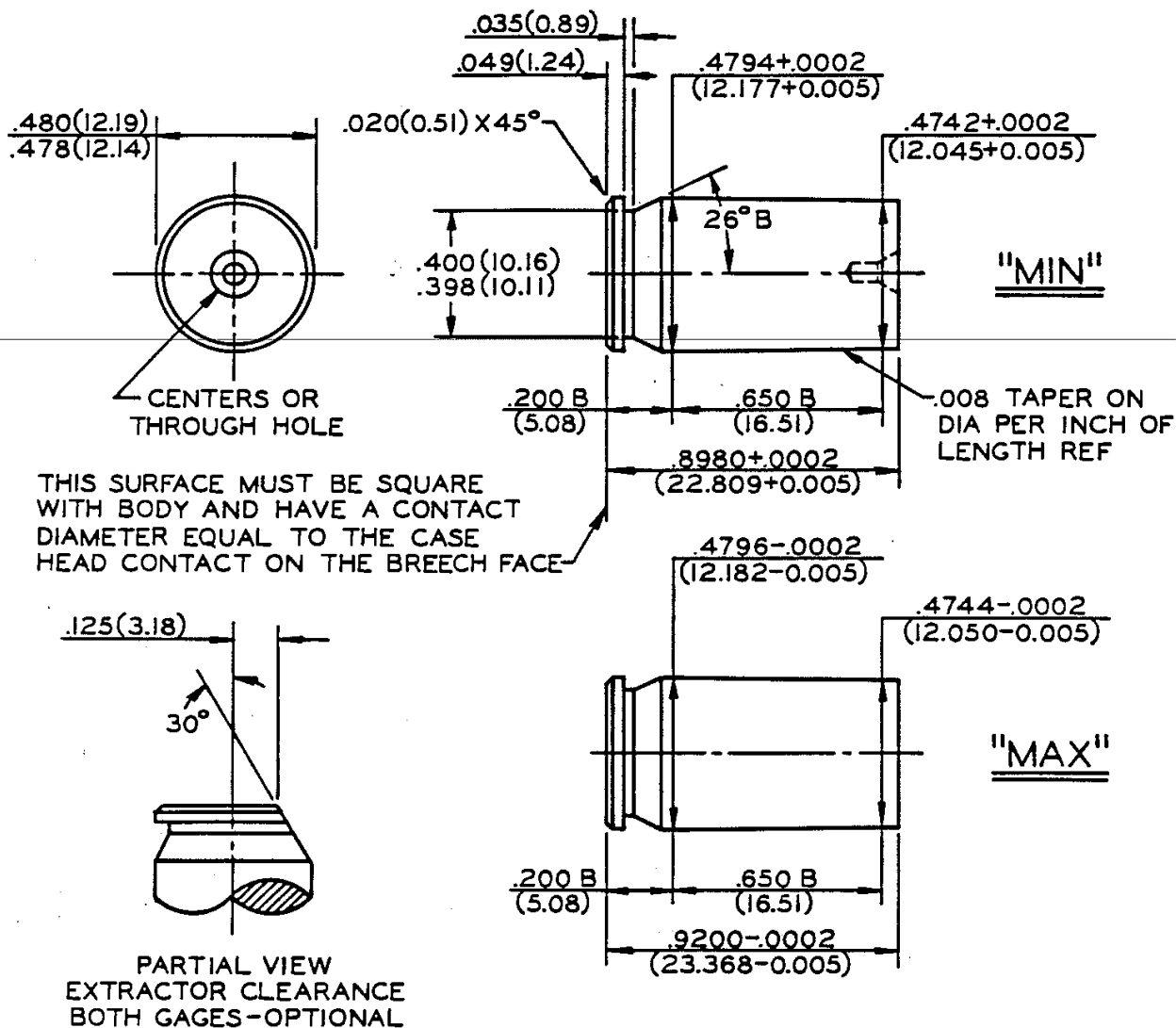


NOTES  
 (XX.XX) = MILLIMETERS  
 HARDEN AND GRIND

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

HEADSPACE GAGES

CENTERFIRE PISTOL & REVOLVER  
HEADSPACE GAGES (FIREARMS)  
MOUTH BREECH (TYPICAL)  
 (CALIBER 45 AUTOMATIC SHOWN)



NOTES

B = BASIC  
 (XX.XX) = MILLIMETERS

HARDEN AND GRIND

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

REFERENCE AMMUNITION SUPPLY

The following calibers of Centerfire Pistol and Revolver Reference Ammunition for the verification of ranges, barrels and other equipment are available.

Information on procurement and assessment data may be obtained from the SAAMI Office. Current assessment data are maintained by the SAAMI Office, P.O. Box 838, Branford, Connecticut 06405.

<u>CARTRIDGE</u>	<u>BULLET</u>	
	<u>WEIGHT</u>	<u>TYPE</u>
9mm Luger	115	MC
9mm Win Mag	115	MC
10mm Automatic	200	FMJ-FP
22 Rem Jet Mag	40	SP
221 Rem Fireball	50	SP
25 Auto	50	MC
256 Win Mag	60	MCHP
30 Luger (7.65mm)	93	MC
32 Automatic	71	MC
32 H&R Magnum	85	JHP
32 Long Colt	82	Lead
32 S&W	88	Lead
32 S&W Long	98	Lead
357 Magnum	158	Lead
357 Rem Max	158	SJHP
38 Long Colt	150	Lead
38 S&W	145	Lead
38 Special	158	Lead
38 Special +P	110	JHP
38 Super Auto +P	130	MC
380 Auto	95	MC
40 S&W	180	JHP
41 Rem Mag	210	Lead
44 Rem Mag	240	Lead
44 Special	246	Lead
45 Auto	230	MC
45 Auto Rim	230	Lead
45 Colt	255	Lead
45 Win Mag	230	MC



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

REFERENCE AMMUNITION SUPPLY

ORDER PROCEDURE

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 Office.
6. Information on the manufacturer of a specific type of ammunition may be obtained from the SAAMI Office, P.O. Box 838, Branford, Connecticut 06405.

EXAMPLE: 200 rounds, Order Symbol SA9LP,  
SAAMI Reference Ammunition,  
9mm Luger, SAAMI lot 5W

NOTE: Recommended Maximum Order: 200

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

REFERENCE CRUSHER SUPPLY

REFERENCE CRUSHER PROCUREMENT

The following sizes and types of Reference Crushers for the verification of ranges, barrels and other equipment are available.

Information on procurement may be obtained from the SAAMI Office, P.O. Box 838, Branford, Connecticut 06405.

<u>Designation</u>	<u>Size</u>	<u>Type</u>
A	.146 x .400	Copper
B	.225 x .500	Copper
C	.225 x .400	Copper

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

REFERENCE CRUSHER SUPPLY

ORDER PROCEDURE

Each order should contain the following information in the following order:

1. Number of crushers desired. (See NOTE below.)
2. Appropriate order symbol.
3. Designation "SAAMI Reference Crushers".
4. Designation of size and type..
5. SAAMI Lot Number - Current lot numbers may be obtained from the SAAMI Office, P.O. Box 838, Branford, Connecticut 06405.

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EXAMPLE:

500 Crushers, Order Symbol  
SAAMI Reference Crushers, .146 x.400  
Copper, SAAMI Lot 416

**NOTE:**

Recommended Maximum Order - 500

SECTION IV - DEFINITIVE PROOF LOADS  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

DEFINITION AND PURPOSE

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

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

Definitive Proof cartridges for pistols should be loaded with the heaviest bullet for the particular cartridge. The slowest powder which will meet the pressure values is used in order to maintain effective pressure distance relationships.

SECTION IV - DEFINITIVE PROOF LOADS  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

CHARACTERISTICS - PROOF LOADS

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 manual.

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 I.

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 I.

Table I

<u>When Max Average Pressure</u>	<u>Definitive Proof Pressure Multiplier</u>	
	<u>Minimum</u>	<u>Maximum</u>
15,000 psi or less	140%	155%
15,100 to 18,000 psi	135%	150%
18,100 to 21,000 psi	130%	145%
21,100 psi and greater	130%	140%

Example:

Cartridge 357 Rem Max      MPLM Pressure = 41,300 psi      S.D. = 2,000 psi

1.      Min. Avg. Proof Pressure = Max Probable Lot Mean Pressure x 1.30  
i.e.: 41,300 psi x 1.30 = 53,690 rounded up to 54,000 psi
2.      Max. Avg Proof Pressure = Max Probable Lot Mean Pressure x 1.40  
i.e.: 41,300 psi x 1.40 = 57,820 rounded down to 57,500 psi
3.      The Proof Standard Deviation, which in the case of Centerfire Pistol & Revolver is equal to the Service Standard Deviation, is multiplied by the constant 5.16, i.e.: 2,000 psi x 5.16 = 10,320 rounded up to 10,400 psi.

SECTION IV - DEFINITIVE PROOF LOADS  
 CENTERFIRE PISTOL & REVOLVER  
 SAAMI VOLUNTARY PERFORMANCE STANDARDS

PRESSURE DATA - PROOF LOADS

<u>Cartridge</u>	<u>Maximum Bullet Weight (Grs.)</u>	<u>Service Maximum Average Pressure</u>	<u>Pressure Values of Proof Cartridges (CUP/100)</u>		
			<u>Minimum Average</u>	<u>Maximum Average</u>	<u>Maximum E.V.</u>
6mm BR Rem	100	520	700	750	134
7mm BR Rem	140	520	700	750	134
9mm Win Mag	115	450	605	650	116
22 Rem Jet Mag	40	400	540	575	103
221 Fireball	50	520	700	750	134
25 Auto	50	180	255	275	46
30 Luger (7.65mm)	93	280	380	400	72
32 Auto	71	150	220	240	38
32 Long Colt	82	130	190	205	33
32 Short Colt	80	130	190	205	33
32 S&W	88	120	124	142	30
32 S&W Long	98	120	124	142	30
357 Mag	158	450	605	650	116
357 Rem Max	158	480	645	690	123
38 Auto	130	230	310	330	59
38 Colt NP	146	120	175	190	30
38 Long Colt	150	120	175	190	30
38 Short Colt	125	120	175	190	30
38 S&W	146	130	190	205	33
38 Special +P	158	200	270	295	51
38 Super Auto +P	130	330	445	475	85
380 Auto	95	170	240	260	43
41 Rem Mag	210	400	540	575	103
44 Rem Mag	240	400	540	575	103
44 S&W Special	246	140	205	220	36
45 Auto Rim	230	150	220	240	38
45 Colt	255	140	205	220	36
45 Win Mag	250	400	540	575	103

SECTION IV - DEFINITIVE PROOF LOADS  
 CENTERFIRE PISTOL & REVOLVER  
 SAAMI VOLUNTARY PERFORMANCE STANDARDS

PRESSURE DATA - PROOF LOADS  
 TRANSDUCER

Cartridge	Maximum Bullet Weight (grs.)	Service Maximum Average Pressure	Pressure Values of Proof Cartridges (psi/100)		
			Minimum Average	Maximum Average	Maximum E.V.
9mm Luger +P	115	385	520	555	104
10mm Auto	200	375	505	540	98
25 Auto	50	250	340	360	67
32 Auto	71	205	275	305	51
357 Mag	158	350	470	505	92
38 Auto	130	265	355	380	67
38 S&W	146	145	210	230	36
38 Spl +P	158	185	250	275	46
38 Super Auto +P	130	365	490	525	92
380 Auto	95	215	290	320	56
40 S&W	180	350	470	505	92
41 AE	180	350	470	505	92
41 Rem Mag	120	360	485	515	92
44 Rem Mag	240	360	485	515	92
45 Auto +P	185	230	310	330	92
45 Colt	255	140	205	220	36
50 AE	325	350	470	505	92

SECTION IV - DEFINITIVE PROOF LOADS  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

SOURCE

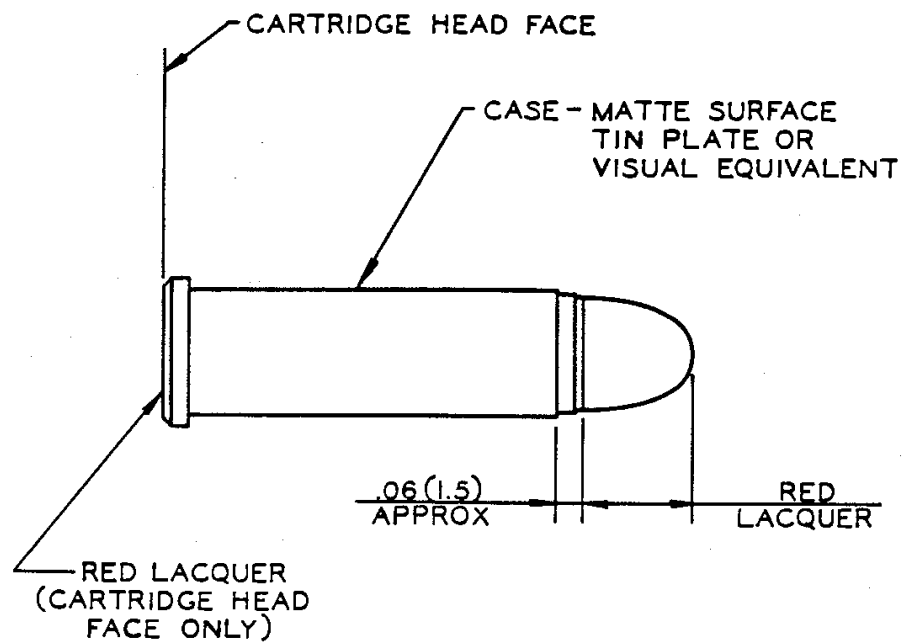
Centerfire Pistol and Revolver Definitive Proof Loads should be used for one purpose only: The proof testing of pistols and revolvers.

A list of suppliers may be obtained from the SAAMI Office, P.O. Box 838, Branford, Connecticut 06405.



SECTION IV - DEFINITIVE PROOF LOADS  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

PROOF CARTRIDGE IDENTIFICATION



NOTE  
(XX.XX) = MILLIMETERS

SECTION IV - DEFINITIVE PROOF LOADS  
CENTERFIRE PISTOL & REVOLVER  
SAAMI VOLUNTARY PERFORMANCE STANDARDS

PACKAGE IDENTIFICATION

CENTERFIRE PISTOL AND REVOLVER  
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 with red lacquer on the bullet and case head.

For consistent results, proof loads should be stored for 2 weeks at  $70^{\circ}\text{F} \pm 5^{\circ}$  ( $21.1^{\circ}\text{C} \pm 2.78^{\circ}\text{C}$ ), and 60% relative humidity before use.

"WARNING: KEEP OUT OF REACH OF CHILDREN"

(Red lettering on white background)