

(R) Spark Plugs

- 1. Scope**—This SAE Standard applies only to spark plugs used for ground vehicles and stationary engines.

This document is intended to serve as a guide to dimensions common to the majority of current production spark plugs and future applications. It is not the intent of this document to prohibit the manufacture of spark plugs having dimensions differing from those presented. Many applications exist which require specialized or nonstandard spark plugs. It is recommended that this document be used in spark plug design and engine applications wherever possible. Whenever design situations arise that prevent the use of one of these standard spark plugs, a spark plug manufacturer should be contacted for guidance.

Figures 1 to 13 and Tables 1A to 6 show typical configurations of unshielded and shielded spark plug designs, their dimensional characteristics, installation, threaded hole, and spark plug thread sizes.

- 1.1 Thread Gages**—In order to keep the wear on threading tools within permissible limits, the threads on the spark plug GO (ring) gage shall be truncated to the maximum minor diameter of the spark plug, and the tapped hole GO (plug) gage to the minimum major diameter of the tapped hole. The plain plug gage for checking the minor diameter of the tapped hole shall be the minimum specified.

- 2. References**—There are no referenced publications specified herein.

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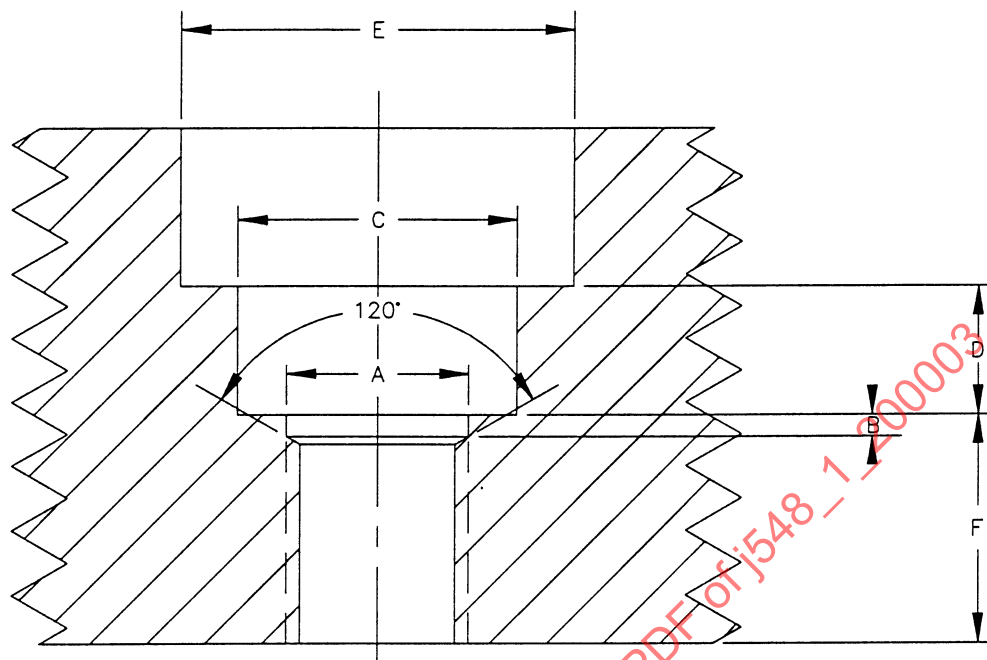


FIGURE 2—HEAD COUNTERBORE—FLAT SEAT (SEE TABLE 2)

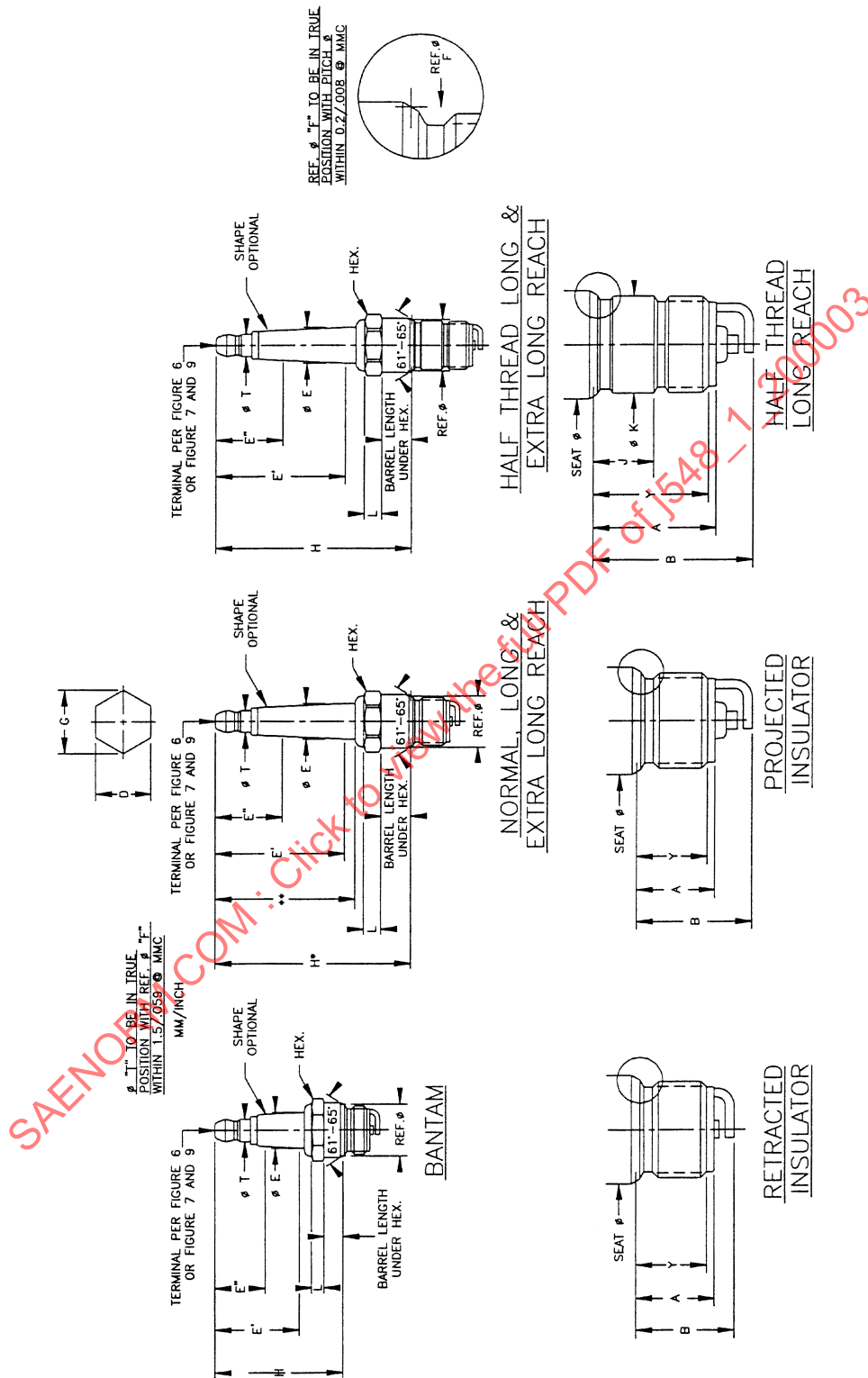


FIGURE 3—CONICAL SEAT SPARK PLUGS (SEE TABLE 3)

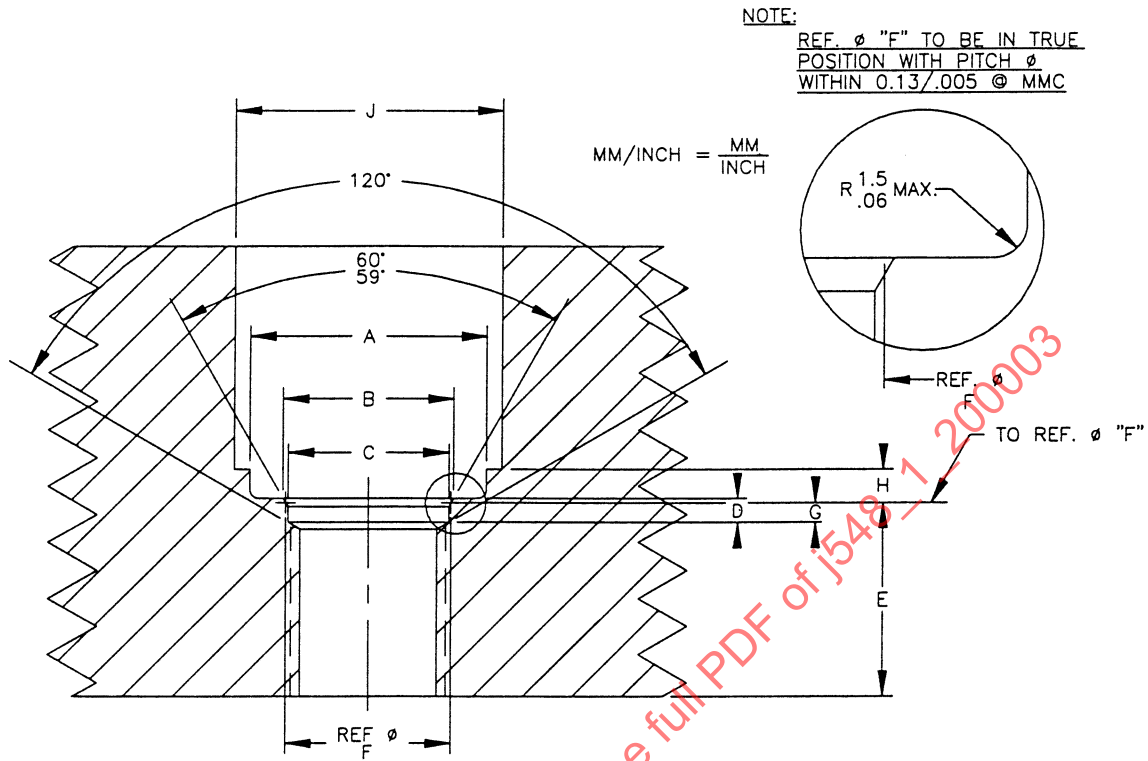


FIGURE 4—HEAD COUNTERBORE—FLAT AND CONICAL SEAT (SEE TABLE 4)

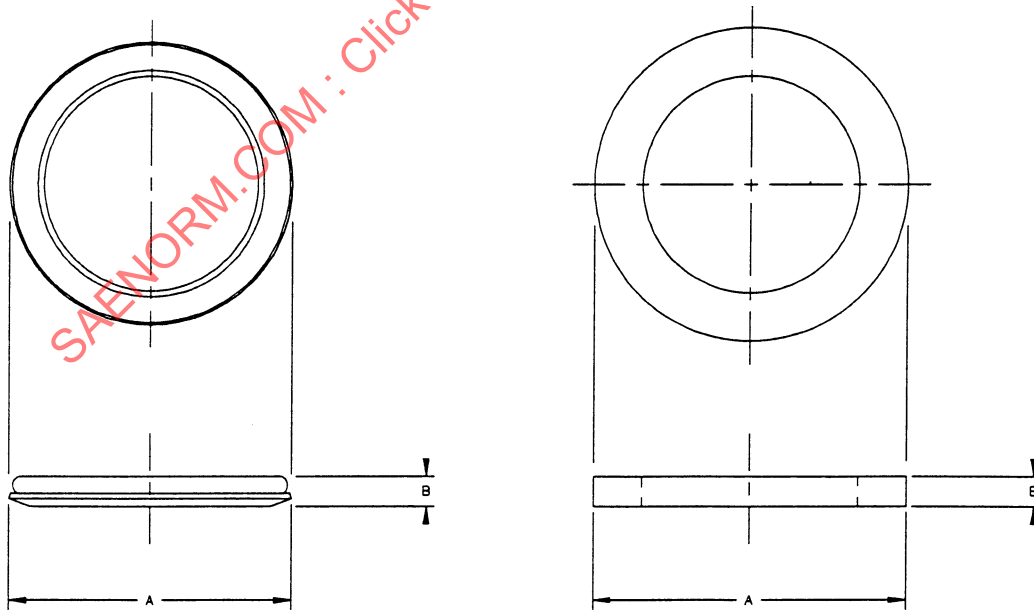


FIGURE 5—OUTSIDE SHELL GASKET (SEE TABLE 5)

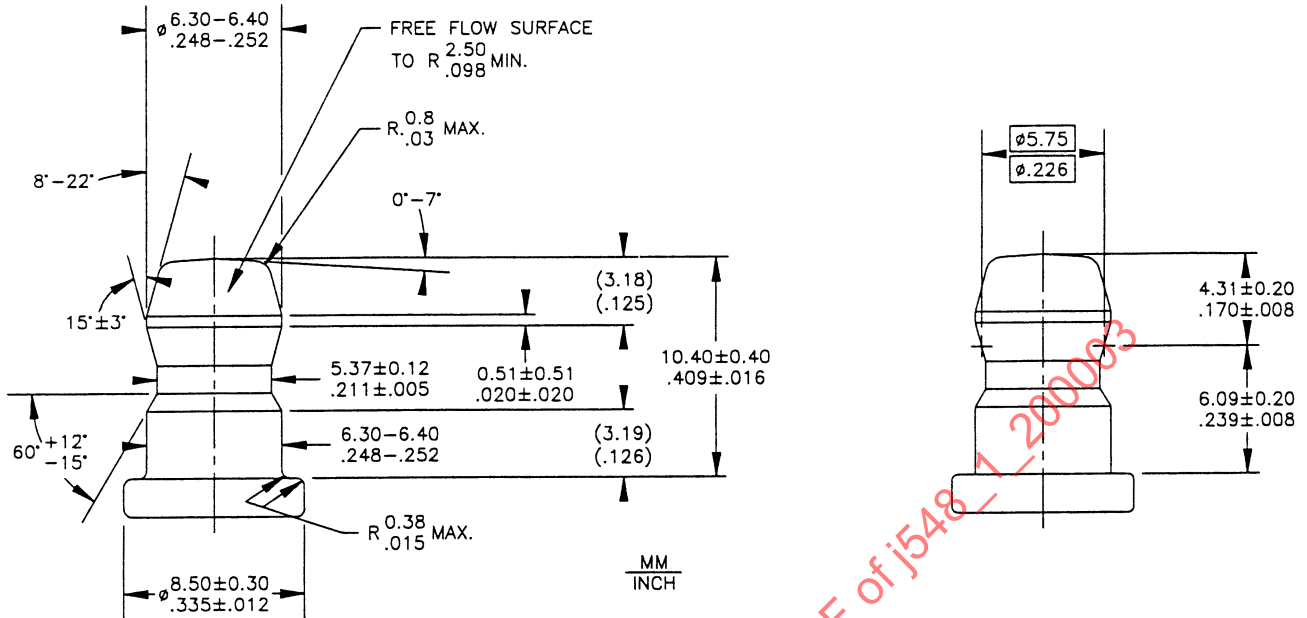


FIGURE 6—SOLID POST TYPE TERMINAL

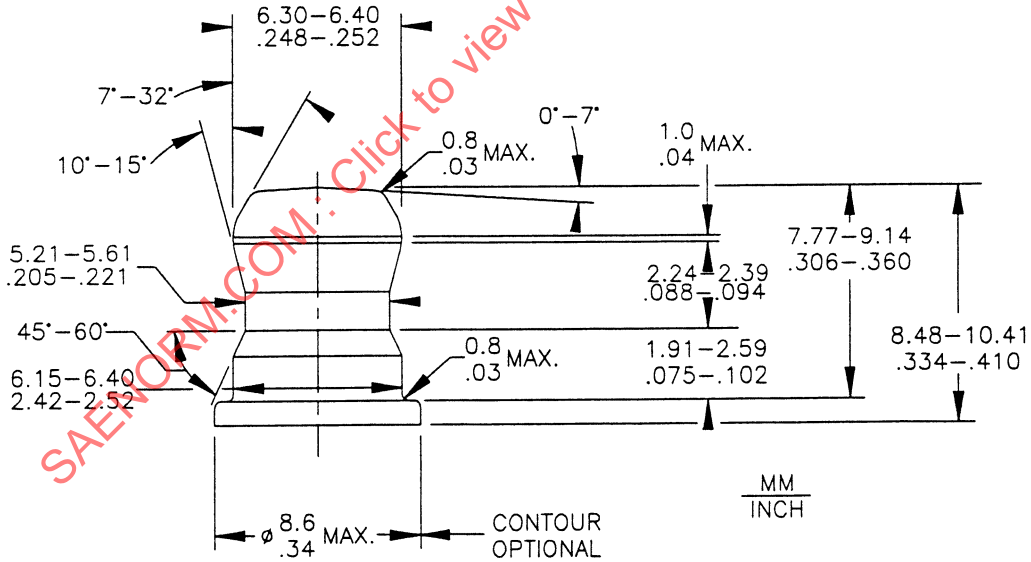


FIGURE 7—ALTERNATE BANTAM SPARK PLUG SOLID POST TYPE TERMINAL

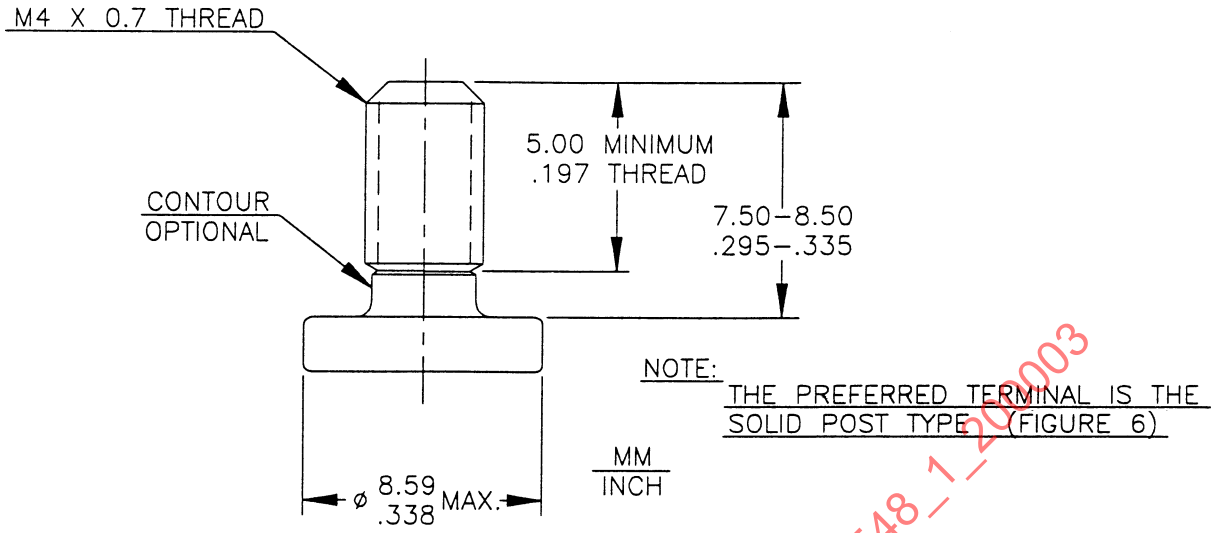


FIGURE 8—THREADED POST TERMINAL (SEE TABLE 6) (6E OR 7E CLASS)

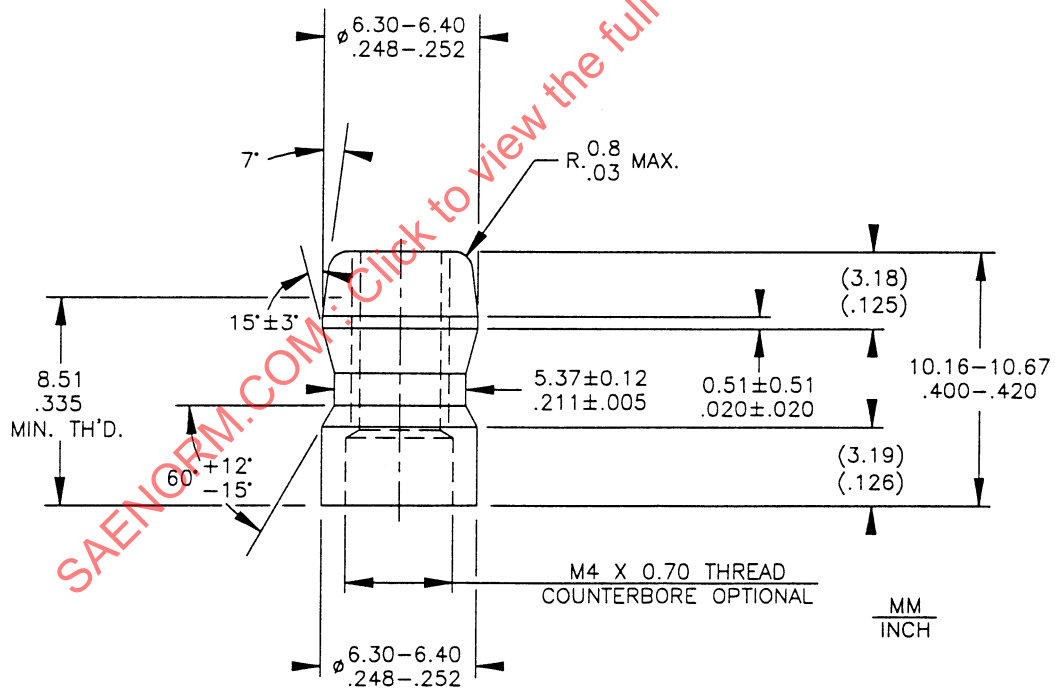


FIGURE 9—NUT TYPE FOR THREADED POST TERMINAL¹ (SEE TABLE 6) (6H CLASS)

1. Same External Dimensions as for Solid Post Terminal

SHIELDED SPARK PLUG TERMINAL CONFIGURATION

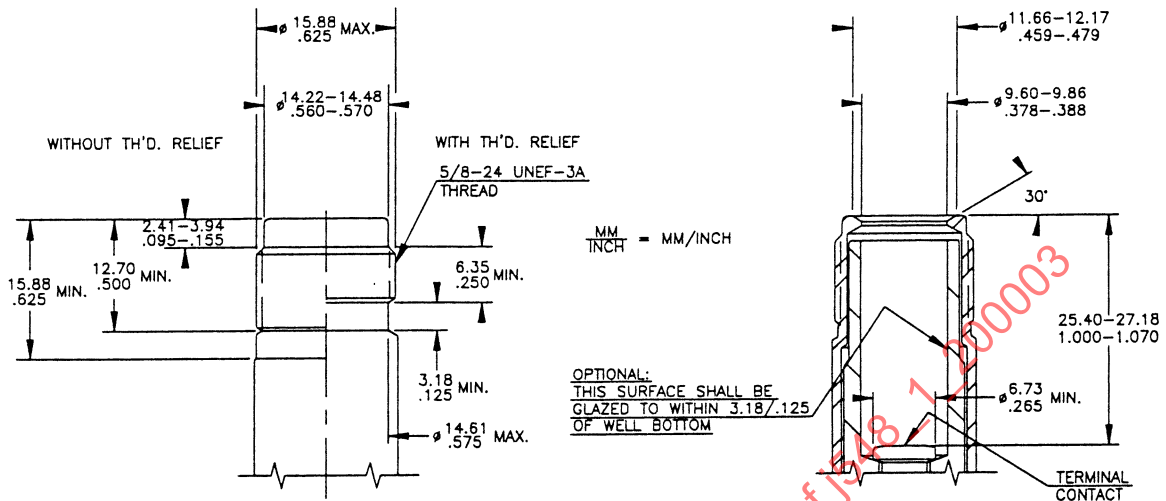


FIGURE 10—5/8-24 THREADED 1 INCH WELL DEPTH

SHIELDED SPARK PLUG TERMINAL CONFIGURATION

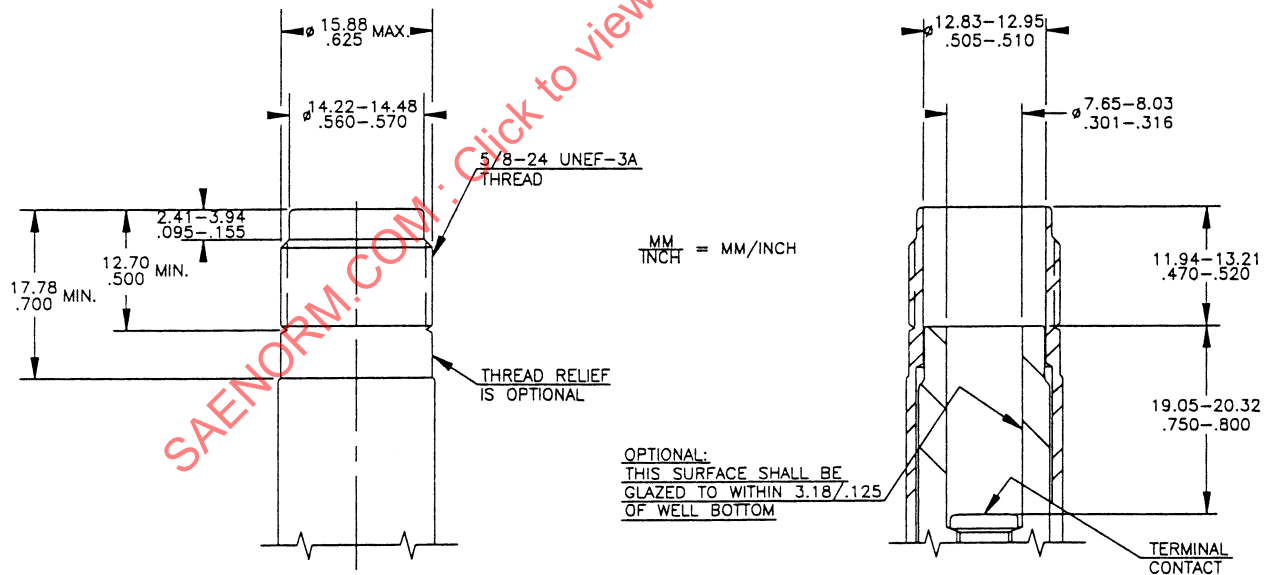


FIGURE 11—5/8-24 THREADED 3/4 INCH WELL DEPTH

SHIELDED SPARK PLUG TERMINAL CONFIGURATION

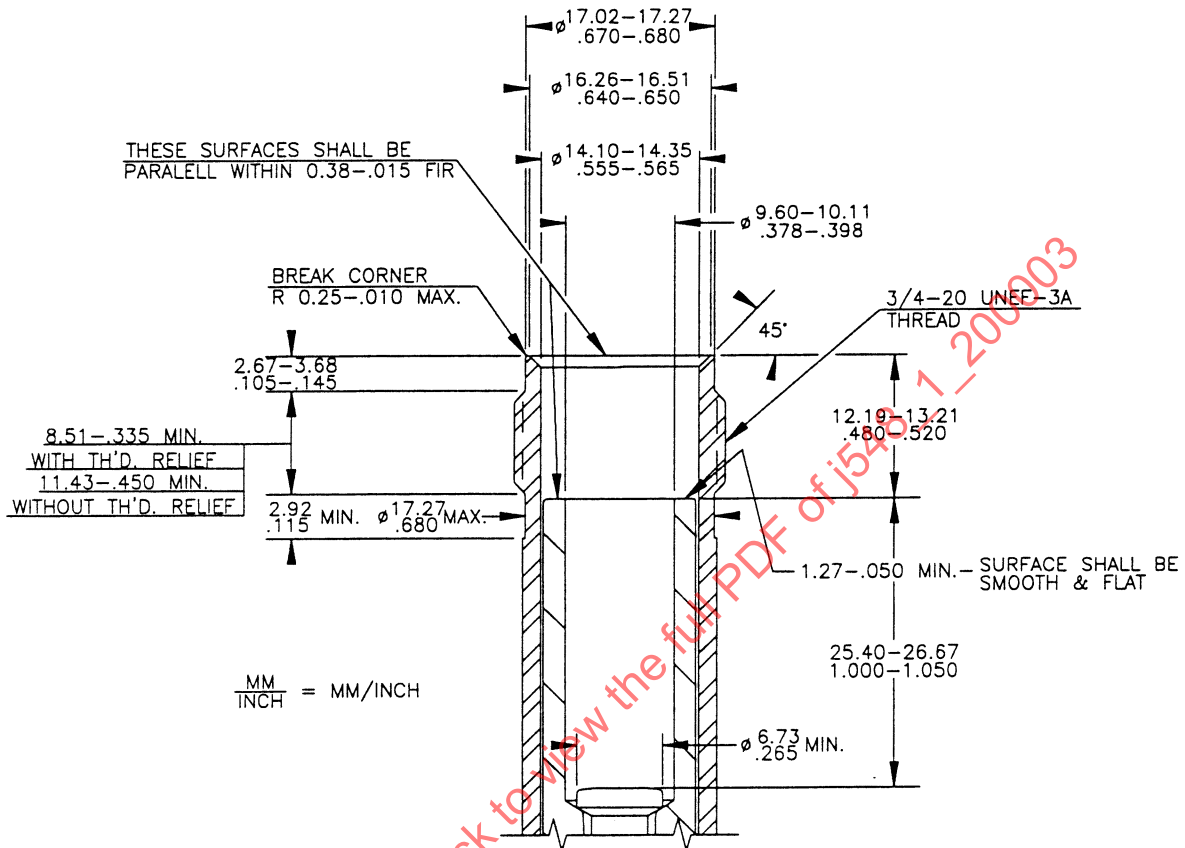


FIGURE 12—3/4-20 THREADED 1 INCH WELL DEPTH

SHIELDED SPARK PLUG TERMINAL CONFIGURATION

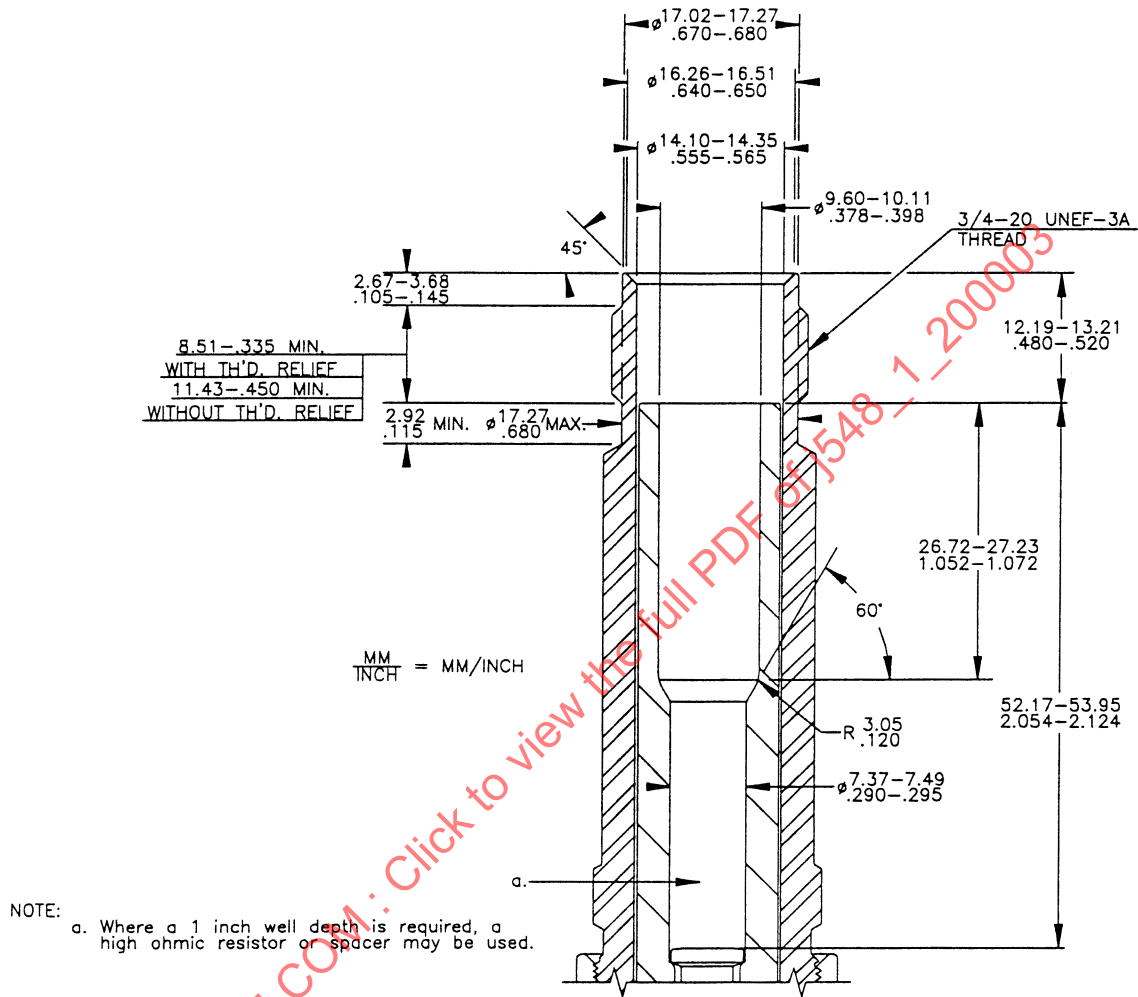


FIGURE 13—3/4-20 THREADED 2-1/8 INCH WELL DEPTH

TABLE 1A—FLAT SEAT SPARK PLUGS (FIGURE 1) mm (in)
M14 X 1.25 (PREFERRED)

Dimension	M14x1.25 19 mm Hex Bantam	M14x1.25 13/16" Hex Short Reach	M14x1.25 13/16" Hex Normal Reach	M14x1.25 16 mm Hex Normal Reach	M14x1.25 13/16" Hex Long Reach	M14x1.25 16 mm Hex Long Reach	M14x1.25 16 mm Extra Long Reach
A, Plug Reach, tol. ⁽¹⁾⁽²⁾	9.53	9.53	12.70	12.70	19.00	19.00	26.50
±0.20 (±0.008)	(0.375)	(0.375)	(0.500)	(0.500)	(0.748)	(0.748)	(1.043)
B, Plug Depth, max ⁽¹⁾⁽³⁾	13.60	13.60	17.80	17.80	24.40		
(retracted insulator)	(0.535)	(0.535)	(0.701)	(0.701)	(0.960)		
B, Plug Depth, max ⁽¹⁾⁽³⁾	16.00	17.20	21.00	21.00	27.00	27.00	34.50
(projected insulator)	(0.630)	(0.677)	(0.827)	(0.827)	(1.063)	(1.063)	(1.358)
Y, Threaded Length & tol ⁽¹⁾	9.02	9.02	11.70	11.70	18.00	18.00	25.50
±0.30 (±0.012)	(0.355)	(0.355)	(0.461)	(0.461)	(0.709)	(0.709)	(1.004)
Hex Size:							
D, across flats	18.80-19.00	20.40-20.80	20.40-20.80	15.73-16.00	20.40-20.80	15.73-16.00	15.73-16.00
	(0.740-0.748)	(0.803-0.819)	(0.803-0.819)	(0.619-0.630)	(0.803-0.819)	(0.619-0.630)	(0.619-0.630)
G, across corners,	21.00	23.00	23.00	17.50	23.00	17.50	17.50
min	(0.827)	(0.906)	(0.906)	(0.689)	(0.906)	(0.689)	(0.689)
L, hex length, min	3.00	4.00	4.00	4.00	4.00	4.00	4.00
	(0.118)	(0.157)	(0.157)	(0.157)	(0.157)	(0.157)	(0.157)
Barrel Length Under	3.00	11.40 ⁽⁴⁾	10.00	3.00	10.00	3.00	3.00
hex, min	(0.118)	(0.449)	(0.394)	(1.18)	(0.394)	(0.118)	(0.118)
Seat Dia., max	19.00	20.80	20.80	20.00	20.80	20.00	20.00
	(0.748)	(0.819)	(0.819)	(0.787)	(0.819)	(0.787)	(0.787)
Insulator							
E, dia & tol ⁽⁵⁾	12.20	12.20	12.20	10.50	12.20	10.50	10.50
±0.30 (±0.012)	(0.480)	(0.480)	(0.480)	(0.413)	(0.480)	(0.413)	(0.413)
E', length ⁽⁵⁾	24.00	33.00	33.00	33.00	33.00	33.00	33.00
	(0.945)	(1.299)	(1.299)	(1.299)	(1.299)	(1.299)	(1.299)
E'', length ⁽⁵⁾	20.00	29.00	29.00	29.00	29.00	29.00	29.00
	(0.787)	(1.142)	(1.142)	(1.142)	(1.142)	(1.142)	(1.142)
H, Installed Height,	46.00	68.00	68.00	50.50-53.50 ⁽⁶⁾	68.00	50.50-53.50 ⁽⁶⁾	50.50-53.50 ⁽⁶⁾
max ⁽⁶⁾	(1.811)	(2.677)	(2.677)	(1.988-2.106)	(2.677)	(1.988-2.106)	(1.988-2.106)
J, Unthreaded Length	(7)	(7)	(7)	(7)	(7)	(7)	(7)
below seat, max							
K, Unthreaded Dia	(7)	(7)	(7)	(7)	(7)	(7)	(7)
below seat, max							

1. Dimensions A, B, and Y include a compressed outside gasket 1.25 mm (0.049 in) thick after torquing at the maximum value recommended in Table 5. If gasket thickness is different than 1.25 mm (0.049 in), a corresponding adjustment to dimensions A, B, and Y must be made.

2. Tolerance dimension of ±0.25 (±0.010) allowed.

3. Dimensions A and B may be adjusted for some types of plugs.

4. Where barrel length under hex requires 11.40 mm (0.449 in), check with engine manufacturer.

5. Between the reference lines E' and E'', the maximum insulator diameter shall be defined by E. If threaded terminals are used without knurl nuts, subtract 3 mm (0.118 in) from the values shown for E' and E''.

6. Installed height includes compressed outside gasket of 1.25 mm (0.049 in) thickness.

7. Dimension does not apply.

*Installed height for threaded terminal type spark plugs (without knurl nuts) is equal to installed height for standard solid terminal type plugs 3 mm ± 1.5 mm.

** On those spark plugs where installed height is controlled with a toleranced dimension, the minimum length from the terminal end to the shell crimp is 34 mm.

TABLE 1B—FLAT SEAT SPARK PLUGS (FIGURE 1) mm (in)

Dimension	M12 x 1.25 16 mm Hex Normal Reach	M12 x 1.25 16 mm Hex Long Reach	M12 x 1.25 14 mm Hex Long Reach	M12 x 1.25 14 mm Hex Extra Long Reach	M10 x 1.0 16 mm Hex Normal Reach	M10 x 1.0 16 mm Hex Long Reach	M10 x 1.0 16 mm Hex Half Thread
A, Plug Reach, to ⁽¹⁾⁽²⁾	12.70	19.00	19.00	26.50	12.70	19.00	19.00
±0.20 (±0.008)	(0.500)	(0.748)	(0.748)	(1.043)	(0.500)	(0.748)	(0.748)
B, Plug Depth, max ⁽¹⁾⁽³⁾	15.80	22.35			15.80	22.35	
(retracted insulator)	(0.622)	(0.880)			(0.622)	(0.880)	
B, Plug Depth, max ⁽¹⁾⁽³⁾	19.00	27.00	27.00	34.50	19.00	27.00	27.00
(projected insulator)	(0.748)	(1.063)	(1.063)	(1.358)	(0.748)	(1.063)	(1.063)
Y, Threaded Length and to ⁽¹⁾	11.70	18.00	18.00	25.50	11.70	18.00	18.00 ⁽⁴⁾
±0.30 (±0.012)	(0.461)	(0.709)	(0.709)	(1.004)	(0.461)	(0.709)	(0.709)
Max Size:							
D, across flats	15.73-16.00	15.73-16.00	13.73-14.00	13.73-14.00	15.73-16.00	15.73-16.00	15.73-16.00
	(0.619-0.630)	(0.619-0.630)	(0.541-0.551)	(0.541-0.551)	(0.619-0.630)	(0.619-0.630)	(0.619-0.630)
G, across corners,	17.50	17.50	15.50	15.50	17.50	17.50	17.50
min	(0.689)	(0.689)	(0.610)	(0.610)	(0.689)	(0.689)	(0.689)
L, hex length, min	4.00	4.00	5.00	5.00	4.00	4.00	4.00
	(0.157)	(0.157)	(0.197)	(0.197)	(0.157)	(0.157)	(0.157)
Barrel Length Under	6.00	6.00	5.00	5.00	6.00	6.00	6.00
hex, min	(0.236)	(0.236)	(0.197)	(0.197)	(0.236)	(0.236)	(0.236)
Seat Dia, max	16.00	16.00	16.00	16.00	16.00	16.00	16.00
	(0.630)	(0.630)	(0.630)	(0.630)	(0.630)	(0.630)	(0.630)
Insulator							
E, dia and to ⁽⁵⁾	10.50	10.50	9.00	9.00	10.50	10.50	10.50
±0.30 (±0.012)	(0.413)	(0.413)	(0.354)	(0.354)	(0.413)	(0.413)	(0.413)
E', length ⁽⁵⁾	33.00	33.00	33.00	33.00	33.00	33.00	33.00
	(1.299)	(1.299)	(1.299)	(1.299)	(1.299)	(1.299)	(1.299)
E'', length ⁽⁵⁾	29.00	29.00	29.00	29.00	29.00	29.00	29.00
	(1.142)	(1.142)	(1.142)	(1.142)	(1.142)	(1.142)	(1.142)
H, Installed Height,	50.50-53.50	50.50-53.50	50.50-53.50	50.50-53.50	50.50-53.50 ⁽⁶⁾	50.50-53.50	50.50-53.50
max ⁽⁷⁾	(1.988-2.106)	(1.988-2.106)	(1.988-2.106)	(1.988-2.106)	(1.988-2.106)	(1.988-2.106)	(1.988-2.106)
J, Unthreaded Length	(8)	(8)	(8)	(8)	(8)	(8)	6.30
below seat, max							(0.248)
K, Unthreaded Dia	(8)	(8)	(8)	(8)	(8)	(8)	11.00
below seat, max							(0.433)

- Dimensions A, B, and Y include a compressed outside gasket 1.25 mm (0.049 in) thick after torquing at the maximum value recommended in Table 5. If gasket thickness is different than 1.25 mm (0.049 in), a corresponding adjustment to dimensions A, B, and Y must be made.
- Tolerance dimension of ±0.25 (±0.010) allowed.
- Dimensions A and B may be adjusted for some types of plugs.
- Dimension includes threaded and unthreaded length.
- Between the reference lines E' and E'', the maximum insulator diameter shall be defined by E. If threaded terminals are used without knurl nuts, subtract 3 mm (0.118 in) from the values shown for E' and E''.
- Installed height of 61 mm max, allowed.
- Installed height includes compressed outside gasket of 1.25 mm (0.049 in) thickness.
- Dimension does not apply.

* Installed height for threaded terminal type spark plugs (without knurl nuts) is equal to installed height for standard solid terminal type plugs 3 mm.

** On those spark plugs where installed height is controlled with a toleranced dimension, the minimum length from the terminal end to the shell crimp is 34 mm.

TABLE 2—HEAD COUNTERBORE—FLAT SEAT (FIGURE 2) mm (in)

M Thread Size and Reach	A Tolerance	B Max	C Min	D Max	E Min	F ⁽¹⁾ Min
M14 x 1.25 Standard:						
Bantam	14.25-14.50 (0.561-0.571)	(2)	(2)	(2)	(2)	8.46 (0.333)
Short Reach	14.25-14.50 (0.561-0.571)	1.70 (0.067)	22.00 (0.866)	10.20 (0.402)	31.00 (1.220)	8.46 (0.333)
Normal Reach	14.25-14.50 (0.561-0.571)	1.70 (0.067)	22.00 (0.866)	9.00 (0.354)	31.00 (1.220)	11.63 (0.458)
16 mm Hex Normal Reach	14.25-14.50 (0.561-0.571)	1.70 (0.067)	22.00 (0.866)	3.00 (0.118)	24.00 (0.945)	11.63 (0.458)
Long Reach	14.25-14.50 (0.561-0.571)	1.70 (0.067)	22.00 (0.866)	9.00 (0.354)	31.00 (1.220)	18.00 (0.709)
16 mm Hex Long Reach	14.25-14.50 (0.561-0.571)	1.70 (0.067)	21.20 (0.835)	3.00 (0.118)	24.00 (0.945)	18.00 (0.709)
16 mm Hex Extra Long Reach	14.25-14.50 (0.561-0.571)	1.70 (0.067)	21.20 (0.835)	3.00 (0.118)	24.00 (0.945)	25.50 (1.004)
M12 x 1.25:						
Normal Reach	12.24-12.50 (0.482-0.492)	1.70 (0.067)	19.00 (0.748)	3.00 ⁽³⁾ (0.118)	29.00 (1.142)	11.63 (0.458)
Long Reach	12.24-12.50 (0.482-0.492)	1.70 (0.067)	19.00 (0.748)	3.00 ⁽³⁾ (0.118)	29.00 (1.142)	18.00 (0.709)
14 mm Hex Long Reach	12.24-12.50 (0.482-0.492)	1.70 (0.067)	19.00 (0.748)	5.00 (0.197)	21.00 (0.827)	18.00 (0.709)
14 mm Hex Extra Long Reach	12.24-12.50 (0.482-0.492)	1.70 (0.067)	19.00 (0.748)	5.00 (0.197)	21.00 (0.827)	25.50 (1.004)
M10 x 1.00:						
Normal reach	10.37-10.50 (0.408-0.413)	1.00 (0.039)	17.02 (0.670)	5.00 (0.197)	25.00 (0.984)	11.63 (0.458)
Long reach	10.37-10.50 (0.408-0.413)	1.00 (0.039)	17.02 (0.670)	5.00 (0.197)	25.00 (0.984)	18.00 (0.709)
Half thread	12.00 max (0.472)	5.80 min (0.228)	17.00 (0.669)	5.00 (0.197)	25.00 (0.984)	18.00 (0.709)

1. This F dimension shall be of sufficient length to ensure that the end of the spark plug thread does not project into the combustion chamber at any point when the gasket is tightened to maximum compressions.

2. Dimension does not apply.

3. Dimension of 3.00 mm encouraged for new designs but not required. Dimension of 5.00 mm allowed.

TABLE 3—CONICAL SEAT SPARK PLUG DIMENSIONS (FIGURE 3) mm (in)

Dimension	M14 x 1.25 Bantam Short Reach	M14 x 1.25 Standard Normal Reach	M14 x 1.25 Standard Long Reach	M14 x 1.25 Half Thread Long Reach	M14 x 1.25 Extra Long Reach	M14 x 1.25 Half Thread Extra Long Reach	M18 x 1.5 Standard Normal Reach
F, Reference dia	14.80 (0.583)	14.80 (0.583)	14.80 (0.583)	14.80 (0.583)	14.80 (0.583)	14.80 (0.583)	19.00 (0.748)
A, Plug Reach, tol ⁽¹⁾ ±0.30 (±0.012)	7.80 (0.307)	11.20 (0.441)	17.50 (0.689)	17.50 (0.689)	25.00 (0.984)	25.00 (0.984)	10.90 (0.429)
B, Plug Depth, max ⁽¹⁾ (retracted, ins.)	11.90 (0.469)	16.30 (0.642)	22.90 (0.902)	22.90 (0.902)	30.40 (1.197)	30.40 (1.197)	18.00 (0.709)
B, Plug Depth, max ⁽¹⁾ (projected ins)	14.00 (0.551)	19.00 (0.748)	25.00 (0.984)	25.00 (0.984)	32.50 (1.280)	32.50 (1.280)	20.00 (0.787)
Y, Threaded Length, tol ±0.30 (±0.012)	7.29 (0.287)	10.20 (0.402)	16.48 (0.649)	16.48 ⁽²⁾ (0.649)	23.98 ⁽³⁾ (0.944)	23.98 ⁽²⁾⁽³⁾ (0.944)	9.90 (0.390)
Hex Size:							
D, across flats	15.73-16.00 (0.619-0.630)	15.73-16.00 (0.619-0.630)	15.73-16.00 (0.619-0.630)	15.73-16.00 (0.619-0.630)	15.73-16.00 (0.619-0.630)	15.73-16.00 (0.619-0.630)	20.40-20.80 (0.803-0.819)
G, across corners, min	17.50 (0.689)	17.50 (0.689)	17.50 (0.689)	17.50 (0.689)	17.50 (0.689)	17.50 (0.689)	23.00 (0.906)
L, hex length, min	3.00 (0.118)	4.00 (0.157)	4.00 (0.157)	4.00 (0.157)	4.00 (0.157)	4.00 (0.157)	4.00 (0.157)
Barrel Length under hex, min	3.00 (0.118)	8.40 (0.330)	8.40 (0.330)	8.40 (0.330)	8.40 (0.330)	8.40 (0.330)	12.00 (0.472)
Seat dia	15.49-15.95 (0.610-0.628)	15.49-15.95 (0.610-0.628)	15.49-15.95 (0.610-0.628)	15.49-15.95 (0.610-0.628)	15.49-15.95 (0.610-0.628)	15.49-15.95 (0.610-0.628)	19.90-20.80 (0.783-0.819)
J, Unthreaded Length below conical seat, max	(4)	(4)	(4)	8.15 (0.321)	(4)	8.46 (0.333)	(5)
K, Unthreaded dia below conical seat, max	(4)	(4)	(4)	13.92 (0.548)	(4)	13.92 (0.548)	(5)
Insulator:							
E, dia and tol ⁽⁵⁾ ±0.30 (±0.012)	10.50 (0.413)	10.50 (0.413)	10.50 (0.413)	10.50 (0.413)	10.50 (0.413)	10.50 (0.413)	12.20 (0.480)
E', length ⁽⁵⁾	24.00 (0.945)	33.00 (1.299)	33.00 (1.299)	33.00 (1.299)	33.00 (1.299)	33.00 (1.299)	33.00 (1.299)
E'', length ⁽⁶⁾	20.00 (0.787)	29.00 (1.142)	29.00 (1.142)	29.00 (1.142)	29.00 (1.142)	29.00 (1.142)	29.00 (1.142)
H, Installed Height max	38.00 (1.496)	63.00 (2.480)	51.00-54.00 ⁽⁶⁾ (1.949-2.126)	49.50-54.00 (1.949-2.126)	51.00-54.00 (1.949-2.126)	49.50-54.00 (1.949-2.126)	68.00 (2.677)

- Dimensions A and B may be adjusted for some types of plugs.
- Dimension includes threaded and unthreaded length.
- Thread length of 23 mm (0.906 in) allowed.
- Dimension does not apply.
- Between the reference lines E' and E'', the maximum insulator diameter shall be defined by E. If threaded terminals are used without knurl nuts, subtract 3 mm (0.118 in) from the values shown for E' and E''.
- Installed height of 63 mm allowed for plugs of low thermal value (IMEP) and long reach as well as for plugs of normal reach.

* Installed height for threaded terminal type spark plugs (without knurl nuts) is equal to installed height for standard solid terminal type plugs 3 mm.

** On those spark plugs where installed height is controlled with a toleranced dimension, the minimum length from the terminal end to the shell crimp is 34 mm.