ASME B5.47 72 ■ 0759670 0046992 7 ■

M-31-05

AMERICAN NATIONAL STANDARD

Milling Machine Arbor Assemblies

ANSI B5.47 - 1972

SECRETARIAT

SOCIETY OF AUTOMOTIVE ENGINEERS
SOCIETY OF MANUFACTURING ENGINEERS
NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

PUBLISHED BY

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

United Engineering Center 345 East 47th Street New York, N. Y. 10017

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FOREWORD

The American National Standard on "Spindle Noses and Arbors for Milling Machines", ANSI B5.18–1960, has served the requirements of industry well in the past. This standard has also found wide international acceptance with only minor modifications. Countries outside the United States became aware of the need to develop standards for milling machine accessories with shanks which fit into the spindle noses of milling machine and other equipment having spindles made according to ANSI B5.18–1960. The American National Standard as published, in spite of its title "Spindle Noses and Arbors for Milling Machines", covers only the relation between the spindle nose and arbor shank but does not deal with complete milling machine accessories. In 1962, The Society of Manufacturing Engineers suggested to The American Society of Mechanical Engineers and to Standards Committee B5, in particular, the need for standardization of at least one complete milling machine accessory, namely the so-called "Milling Machine Arbor". It was suggested that this matter be made a subject of investigation by a technical committee to arrive at a standard. Considerable preliminary work was done by members of the Standards Committee of the Chicago Chapter of SME. This study covered a review of existing American manufacturers' standards and also made comparisons with proposed and/or adopted ISO, British, and German DIN standards.

The taper shank of the majority of milling machine arbors currently used is made according to ANSI B5.18–1960. The use of the standard as it relates to the standardization of the shaft, the spacing collars, bearing sleeve, nut, etc. is recommended in all cases where shanks other than ANSI B5.18–1960 are contemplated to be used.

This standard was approved as the American National Standard on September 15, 1972.

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AMERICAN NATIONAL STANDARD

MILLING MACHINE ARBOR ASSEMBLIES

1. Scope

1.1 The standard is confined to milling machine arbors. The reason for confining this standard to this specified milling machine accessory is that through many years of development and general usage, there already exists good agreement on the structure and dimensions of milling machine arbors between competent manufacturers of such equipment here in the United States and abroad. This agreement is much better than for many other milling machine accessories and equipment. Already considerable interchangeability exists between the products of various suppliers of milling machine arbors.

The standard tries to avoid being too specific in nonessential details to avoid undue hardship on the manufacturer. The choice of material, heat treatment, surface finish any deviations from nonessential dimensions is left to the discretion of the manufacturer as long as it is compatible with the expected functional requirements of the arbor assembly. The many overlapping and intermediate sizes of the various components of an arbor assembly are minimized for the sake of economy. Some sizes of arbors and components still listed by some manufacturers have been omitted with the knowledge that some other listed sizes would do the required operations without undue hardship.

True position tolerances and symbols are in accordance with ANSI Y14.5–1966.

2. Definitions

2.1 Arbor Diameter

The arbor diameter is the nominal diameter of the milling machine arbor. It defines the size of the "hole" cutter which can be mounted and driven by the arbor. The arbor diameter size and its tolerance is intended to provide the proper fit and locating accuracy in the bore of the "hole" cutter.

2.2 "Shoulder to Nut" Length

The "Shoulder to Nut" length is the length of the arbor available between the shoulder and the face of the arbor nut. This length is considered the nominal length of the milling machine arbor.

2.3 Pilot

The pilot at the end of a style "A" milling machine arbor is provided to give usually smaller milling machine arbors added support and rigidity.

2.4 Shoulder Collar

The shoulder collar is a collar with a larger chamfer on the inner diameter than the spacing collars. This large chamfer is intended to prevent interference with a stress reducing fillet radius at the shoulder.

2.5 Spacing Collar

A spacing collar is a bushing type collar furnished in various lengths. It has an inner diameter to fit with a specified clearance on the arbor diameter, it has a keyway to clear the key in the arbor. The end faces of the spacing collar are required to be parallel within specified limits to avoid distortion and inaccuracies of the arbor when assembled on the arbor.

2.6 Bearing Sleeve

Bearing sleeves act as bearing journals in the bearing supports to give increased rigidity and support to the arbor. The bearing sleeve fits closely on the arbor diameter and in the support bushing.

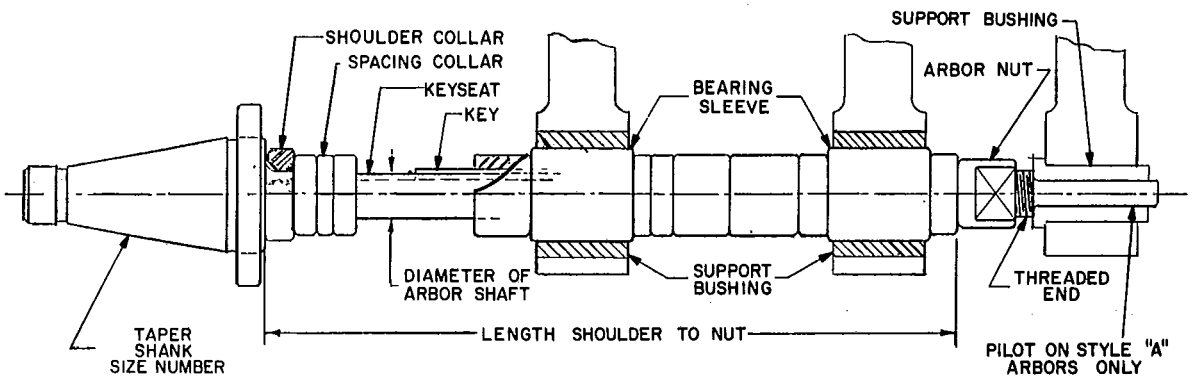
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2.7 Arbor Nut

The arbor nut, when tightened, converts the milling machine arbor, when assembled with the proper collars, cutters, and sleeves into one rigid unit.

2.8 Key – Keyseat

The arbor diameter is provided with a Keyseat and a required length of keystock to give a driving connection between arbor, cutters, and bearing sleeves.



NOMENCLATURE OF MILLING MACHINE ARBORS

STYLE "A" ARBORS HAVE A PILOT BEYOND THREADED END
STYLE "B" ARBORS HAVE NO PILOT

CODING OF MILLING MACHINE ARBORS

TAPER SHANK SIZE NUMBER	DIAMETER AND STYLE OF ARBOR	LENGTH SHOULDER TO NUT	BEARING SLEEVE IDENT. NO.	NUMBER OF BEARING SLEEVE
50	1A	18	4	2

Example 1. 50 1-1/4B 18 4 2, AN Standard No. 50 Taper Shank, 1.250 diameter of arbor shaft, Style B Arbor, 18-inch length shoulder to nut, #4 bearing sleeve, 2 bearing sleeves on arbor.

Example 2. 40 7/8A 12, AN Standard No. 40 Taper Shank, 0.875 diameter of arbor shaft, Style A Arbor, 12-inch length shoulder to nut, with no bearing sleeves.

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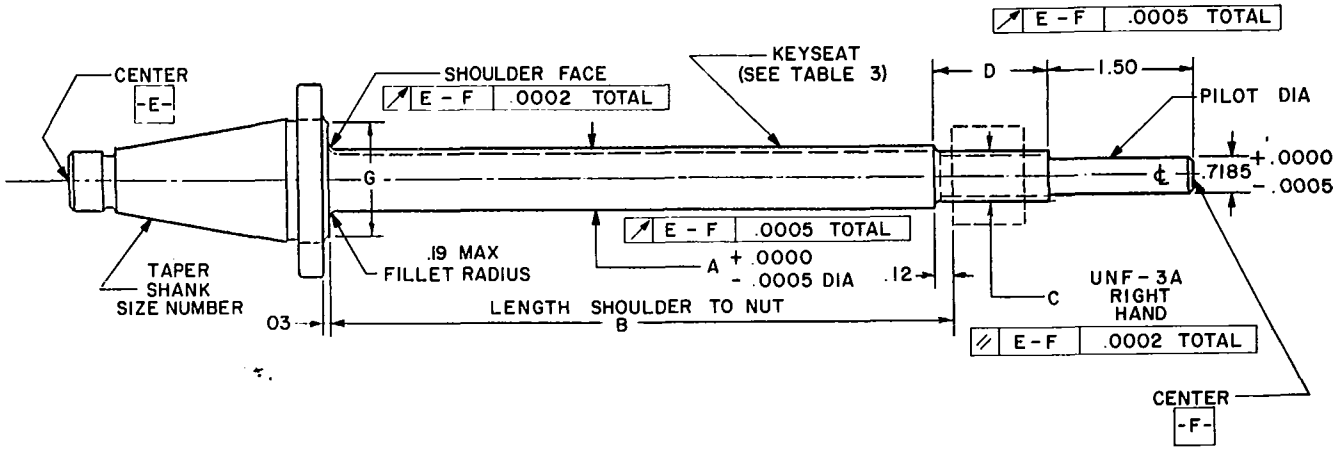


Table 1. Style A Arbor Shafts

Taper Shank Size No.	Diameter of Arbor A	Length Shoulder to Nut B				Thread Size C	Thread Length D	Shoulder Diameter ±0.02 G
30	0.8745		10			0.875–14	1.00	1.62
	0.9995		10	12		1.000–12	1.38	1.75
40	0.8745	8		12		0.875–14	1.00	1.62
	0.9995	8		12	16	1.000–12	1.38	1.75
	1.2495			12	16	1.000–12	1.38	2.12
50	0.8745	8	10	12		0.875–14	1.00	1.62
	0.9995	8		12	18	1.000–12	1.38	1.75
	1.2495			12	18	1.000–12	1.38	2.12

All dimensions given in Inches.

TOLERANCES: –

"A" Diameter of Arbor & Pilot Diameter concentric with axis E–F 0.0005 total.

Shoulder face perpendicular to axis E–F 0.0002 total.

Inspection for Total Indicator Variation to be performed between Centers without assembly of spacing collars and sleeves.

Pitch Diameter of Thread concentric with axis E–F 0.002 total.

30–40–50 Taper Shanks – see ANSI B5.18–1972 Spindle Noses & Tool Shanks for Milling Machines.

True position tolerances and symbols are in accordance with ANSI Y14.5–1966.

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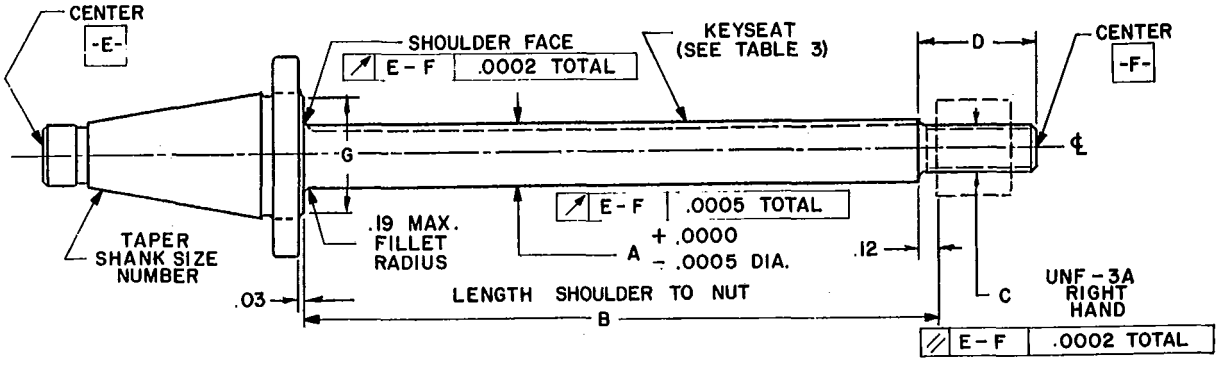


Table 2. Style B Arbor Shafts

Taper Shank Size No.	Diameter of Arbor A	Length Shoulder to Nut B							Thread Size C	Thread Length D	Shoulder Diameter ± 0.02 G
30	0.8745	8	12						0.875 – 14	1.00	1.62
	0.9995	8	12						1.000 – 12	1.38	1.75
40	0.8745	8	12						0.875 – 14	1.00	1.62
	0.9995	8	12	14	18				1.000 – 12	1.38	1.75
	1.2495		12	14	18				1.000 – 12	1.38	2.12
50	0.8745	8	12						0.875 – 14	1.00	1.62
	0.9995		12		18	24			1.000 – 12	1.38	1.75
	1.2495				18	24	30		1.000 – 12	1.38	2.12
	1.4995				18	24	30	36	1.500 – 12	1.88	2.38
	1.9995					24	30	36	2.000 – 12	2.25	3.25
	2.4995						30	36	2.000 – 12	2.25	3.50

All dimensions given in Inches.

TOLERANCES:

"A" Diameter of Arbor concentric with axis E–F 0.0005 total.

Shoulder face perpendicular to axis E–F 0.0002 total.

Inspection for Total Indicator Variation to be performed between centers without assembly of spacing collars and sleeves.

30–40–50 Taper Shanks – see ANSI B5.18–1972 Spindle Noses and Tool Shanks for Milling Machines.

Pitch Diameter of Thread concentric with axis E–F 0.002 total.

True position tolerances and symbols are in accordance with ANSI Y14.5-1966.

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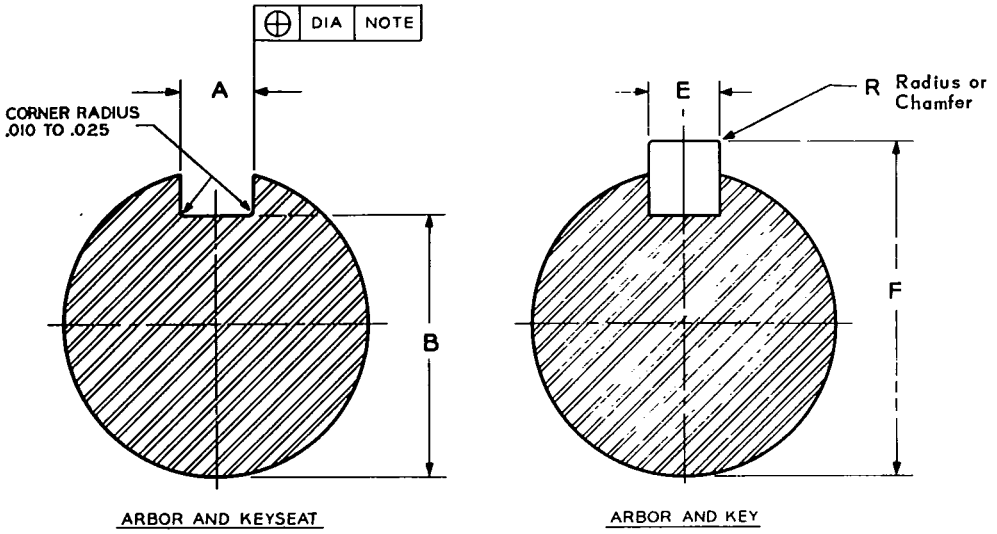


Table 3. Keyseat and Key Dimensions

Nominal Arbor Diameter	Nominal Size Key Square	Arbor and Keyseat		Arbor and Key		R Max.
		A	B	E	F	
0.875	0.1250	0.1250 0.1260	0.8125 0.8075	0.1245 0.1240	0.9375 0.9315	0.03
1.000	0.2500	0.2500 0.2510	0.8438 0.8388	0.2495 0.2490	1.0940 1.0880	0.05
1.250	0.3125	0.3125 0.3135	1.0630 1.0580	0.3120 0.3115	1.3750 1.3690	0.06
1.500	0.3750	0.3750 0.3760	1.2810 1.2760	0.3745 0.3740	1.6560 1.6500	0.06
2.000	0.5000	0.5000 0.5010	1.6870 1.6820	0.4995 0.4990	2.1880 2.1820	0.06
2.500	0.6250	0.6250 0.6260	2.0940 2.0890	0.6245 0.6240	2.7100 2.7120	0.06

All dimensions are given in Inches.

NOTE: The dimensions listed above are from Table 69 of ANSI B94.19–1968, page 79 – Milling Cutters and End Mills.

TOLERANCES:

Keyway to be on True Position with axis of Arbor within 0.001 per foot of Arbor length.
True position tolerances and symbols are in accordance with ANSI Y14.5–1966.

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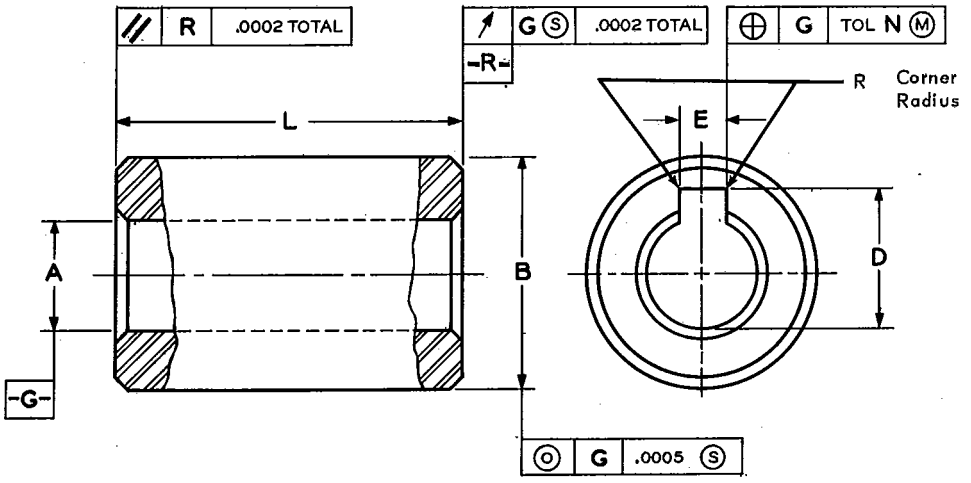


Table 4. Essential Dimensions of Bearing Sleeves

Size Number	Hole Diameter A	Outside Diameter B	Keyseat D	Keyseat E	Length L	Keyseat True Position Tolerance N
3	0.8750 0.8755	1.8743 1.8738	0.9475 0.9575	0.130 0.137	3.23 3.27	0.005
	1.0000 1.0005		1.104 1.114	0.255 0.262		0.005
	1.2500 1.2505		1.385 1.395	0.318 0.343		0.005
4	0.8750 0.8755	2.1243 2.1238	0.9475 0.9575	0.130 0.137	3.73 3.77	0.005
	1.0000 1.0005		1.104 1.114	0.255 0.262		0.005
	1.2500 1.2505		1.385 1.395	0.318 0.343		0.005
	1.5000 1.5005		1.666 1.676	0.385 0.410		0.010
5	1.0000 1.0005	2.7493 2.7488	1.104 1.114	0.255 0.262	4.23 4.27	0.005
	1.2500 1.2505		1.385 1.395	0.318 0.343		0.005
	1.5000 1.5005		1.666 1.676	0.385 0.410		0.010
	2.0000 2.0005		2.198 2.208	0.510 0.535		0.010
6	2.0000 2.0005	3.3743 3.3738	2.198 2.208	0.510 0.535	4.23 4.27	0.010
	2.5000 2.5005		2.733 2.743	0.635 0.660		0.010

All dimensions given in Inches.

TOLERANCES:

(B) Outside diameter concentric with (A) hole diameter within 0.0005 total.
End faces parallel within 0.0002 total.
Runout of end faces to be within 0.0005 total with regard to (A) hole diameter.

(E) Keyseat to be on true position with Hole "A" within tolerance N.

NOTE: The dimensions listed in column "D" and "E" are from Table 69 of ANSI B94.19–1968, page 79 – Milling Cutters and End Mills.

(R) Corner radius for (A) 0.8750 max 0.03
1.0000 max 0.05
1.2500 and up max 0.06

True position tolerances and symbols are in accordance with ANSI Y14.5-1966.

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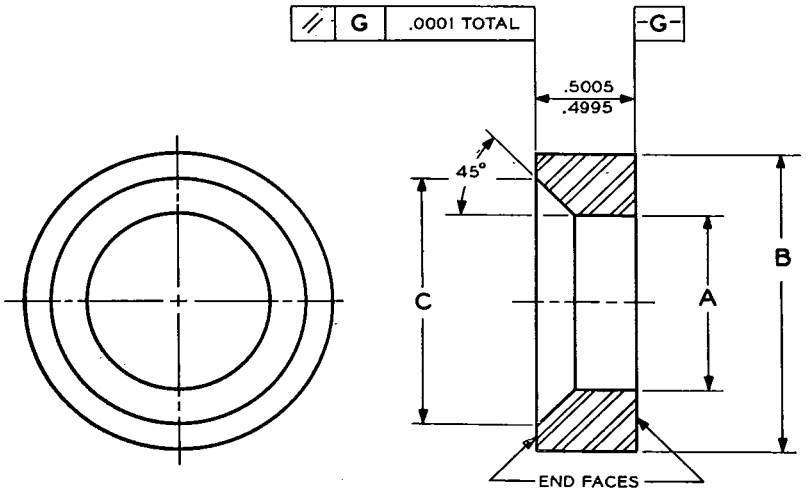


Table 5. Essential Dimensions of Shoulder Collars

Hole Diameter A	Outside Diameter B	Chamfer Diameter C
0.878 0.881	1.62 1.61	1.36 1.38
1.003 1.006	1.75 1.74	1.49 1.51
1.253 1.256	2.12 2.11	1.74 1.76
1.503 1.506	2.38 2.37	1.99 2.01
2.003 2.006	3.25 3.24	2.49 2.51
2.503 2.506	3.50 3.49	2.99 3.01

All dimensions given in Inches.

TOLERANCES:

End faces parallel within 0.0001 total.

True position tolerances and symbols are in accordance with ANSI Y14.5-1966.

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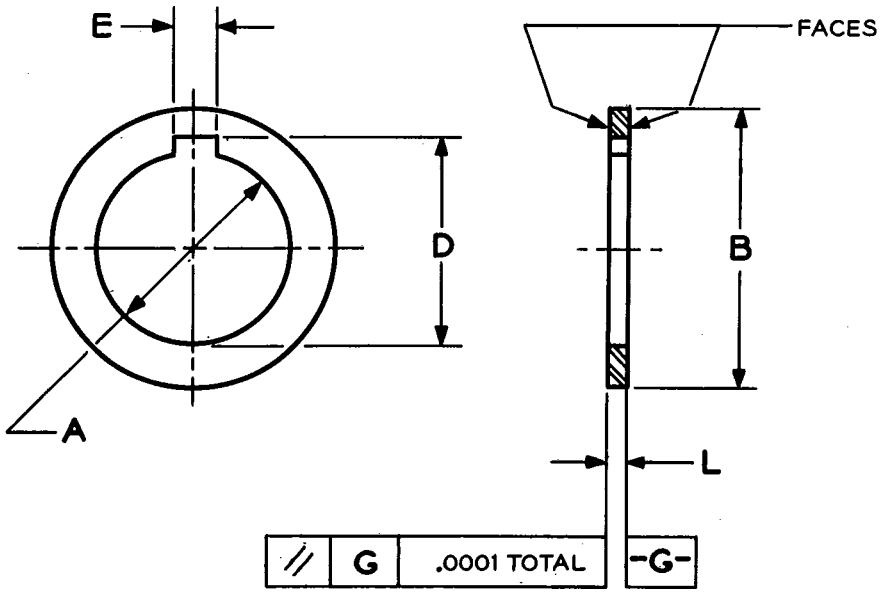


Table 6. Essential Dimensions of Stamped Type Spacing Collars

Hole Diameter A	Outside Diameter B	Length L	Keyseat D	Keyseat E
0.878 0.881	1.38 1.37	0.001 0.002 0.003 0.004 0.005 0.006 0.007 0.008 0.010 0.015 0.020 0.025	0.948 0.958	0.130 0.137
1.003 1.006	1.50 1.49		1.104 1.114	0.255 0.262
1.253 1.256	1.75 1.74		1.385 1.395	0.318 0.343
1.503 1.506	2.12 2.11		1.666 1.676	0.385 0.410
2.003 2.006	2.74* 2.73		2.198 2.208	0.510 0.535
2.503 2.506	3.25 3.24		2.733 2.743	0.635 0.660

All dimensions given in Inches.

TOLERANCES:

Faces parallel within 0.0001 total.

All stamped edges to be free of burrs.

NOTE: The dimensions listed in column "D" and "E" are from Table 69 of ANSI B94.19–1968, page 79 – Milling

True position tolerances and symbols are in accordance with ANSI Y14.5-1966.

*Must be smaller than the outside diameter of No. 5 size bearing sleeve to facilitate assembly.

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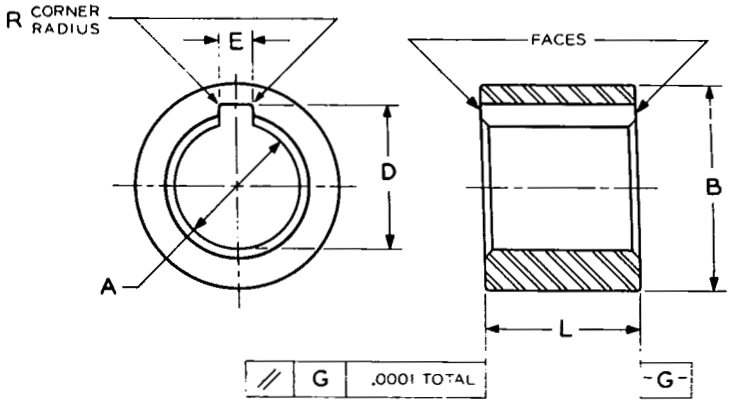


Table 7. Essential Dimensions of Spacing Collars

Hole Diameter A	Outside Diameter B	Length L	Keyseat D	Keyseat E	Keyseat R
0.878 0.881	1.38 1.37	0.255 0.245	0.948 0.958	0.130 0.137	0.03
1.003 1.006	1.50 1.49	0.505 0.495	1.104 1.114	0.255 0.262	0.05
1.253 1.256	1.75 1.74	1.005 0.995	1.385 1.395	0.318 0.343	0.06
1.503 1.506	2.12 2.11	2.005 1.995	1.666 1.676	0.385 0.410	0.06
2.003 2.006	2.74* 2.73		2.198 2.208	0.510 0.535	0.06
2.503 2.506	3.25 3.24		2.733 2.743	0.635 0.660	0.06

All dimensions given in Inches.

TOLERANCES:

Faces to be parallel within 0.0001 total.

NOTE: The dimensions listed in column "D" and "E" are from Table 69 of ANSI B94.19–1968, page 79 – Milling Cutters and End Mills.

*Must be smaller than the outside diameter of No. 5 size bearing sleeve to facilitate assembly.

Corner Radius for (A) 0.878 max 0.03
1.003 max 0.05
1.253 and up max. 0.06

True position tolerances and symbols in accordance with ANSI Y14.5–1966.

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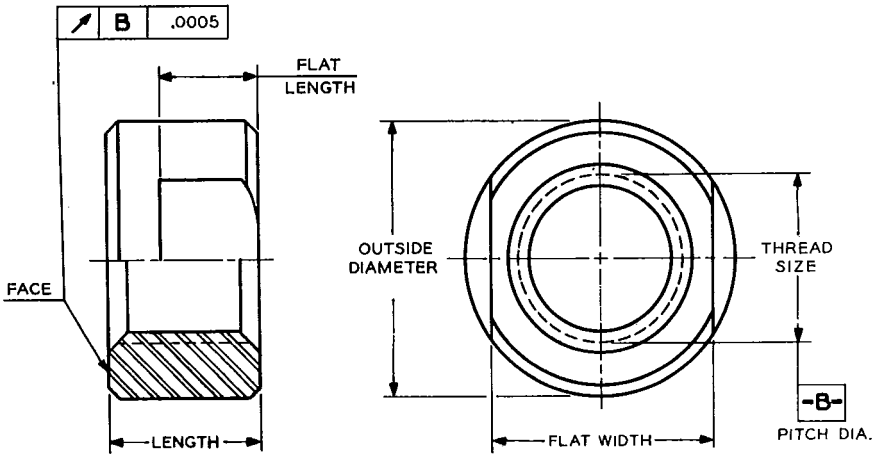


Table 8. Essential Dimensions of Arbor Nuts

Nominal Arbor Diameter	Thread Size UNF–3B Right Hand	Length ±0.020	Outside Diameter ±0.020	Flat Width +0.000 −0.010	Flat Length ±0.020
0.875	0.875 – 14	0.75	1.38	1.12	0.50
1.000 1.250	1.000 – 12	0.88	1.62	1.25	0.62
1.500	1.500 – 12	1.31	2.10*	1.81	0.81
2.000 2.500 Note 1	2.000 – 12	1.75	2.72*	2.38	1.12

All dimensions given in Inches.

TOLERANCES:

Face runout with regard to pitch diameter of threads within 0.0005 Total Indicator Variation.

NOTE 1: The 2.500 Arbor requires a spacer ring placed in front of the nut. Nominal ring dimensions are 3.250 O.D. x .500 wide.

True position tolerances and symbols are in accordance with ANSI Y14.5-1966.

*Must be smaller than the outside diameters of No. 4 & No. 5 bearing sleeves to facilitate assembly.

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AMERICAN NATIONAL STANDARDS FOR MACHINE TOOLS

T-Slots, Their Bolts, Nuts, Tongues, and Cutters B5.1–1949
Rotating Air Cylinders and Adapters B5.5–1959
Chucks and Chuck Jaws B5.8–1972
Spindle Noses for Tool Room Lathes, Engine Lathes, Turret Lathes, and Automatic Lathes B5.9–1967
Machine Tapers . . . . . B5.10–1963 (Reaffirmed 1972)
Spindle Noses and Adjustable Adapters for Multiple Spindle Drilling Heads B5.11–1964
Accuracy of Engine and Tool Room Lathes . . . . . B5.16–1952 (Reaffirmed 1972)
Spindle Noses and Tool Shanks for Milling Machines B5.18–1972
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BINDERS FOR HOLDING STANDARDS ARE AVAILABLE.

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