

ASME B94.33.1-1997

JIG BUSHINGS (METRIC)

AN AMERICAN NATIONAL STANDARD



The American Society of
Mechanical Engineers



JIG BUSHINGS (METRIC)

ASME B94.33.1-1997

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FOREWORD

(This foreword is not part of ASME B94.33.1-1997.)

In December 1996 ANSI approved the ASME B94.33.1-1996 Standard on Jig Bushings. Following the completion of this work, the B94 Subcommittee on Jig Bushings undertook the development of a metric jig bushing standard. The format closely followed that of the inch Standard and the work was completed on April 11, 1997, when the document was approved by the B94 Main Committee. The B94.33.1 Standard was approved by ANSI on September 22, 1997.

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Cutting Tools, Holders, Drivers, and Bushings

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CONTENTS

Foreword	iii
Standards Committee Roster	v
1 Scope	1
2 Purpose	1
3 General	1
3.1 Press Fit Bushings	1
3.2 Renewable Bushings	1
3.3 Liner Bushings	1
3.4 Bushing Specifications	1
4 Jig Bushing Designation System	1
4.1 Type Bushing	1
4.2 Body Diameter	1
4.3 Body Length	1
4.4 Inside Diameter	1
4.5 Example	2
5 Designation System for Lockscrews and Clamps	2
5.1 Letters "LSM" Denote Lockscrew	2
5.2 Letters "RCM" Denote Round Clamp	2
Figures	
1 Press Fit Bushings	2
2 Renewable Bushings and Liner Bushings	2
Tables	
1 Plain-Type Press Fit Bushings (Type PM)	3
2 Head-Type Press Fit Bushings (Type HM)	5
Specifications for Plain- and Head-Type Press Fit Bushings	4
3 Slip-Fixed Type Renewable Bushings (Type SFM)	8
Specifications for Slip-Fixed Type Renewable Bushings	7
4 Plain-Type Liner Bushings (Type PM)	10
5 Head-Type Liner Bushings (Type HM)	12
Specifications for Plain- and Head-Type Liner Bushings	7
6 Lockscrews for Standard Mounting of Slip-Fixed Renewable Bushings	13
7 Lockscrews for Projected Mounting of Slip-Fixed Renewable Bushings	14
Specifications for Lockscrews	7

8	Optional Round Clamps for Standard Mounting of Slip-Fixed Renewable Bushings	14
9	Optional Round Clamps for Projected Mounting of Slip-Fixed Renewable Bushings	15
	Specifications for Round Clamps	7
10	Locking-Mechanism Dimensions of Slip-Fixed Renewable Bushings	15
11	Standard Metric Drill Sizes	16

METRIC JIG BUSHINGS

1 SCOPE

This Standard covers the American National Standard practice for sizes, types, tolerances, and identification of metric jig bushings and locking devices used for securing the bushing in the jig or bushing plate.

2 PURPOSE

The purpose of this Standard is to provide the necessary information for the design, procurement, and installation of metric jig bushings.

3 GENERAL

3.1 Press Fit Bushings

Press fit bushings to guide the tool are installed directly in the jig without the use of a liner and are employed principally where the bushings are used for short production runs and will not require replacement. They are also intended for use where the closeness of the center distance of holes will not permit the installation of liners and renewable bushings. Press fit bushings are made in two types, with heads and without. (See Fig. 1.)

3.2 Renewable Bushings

Renewable bushings to guide the tool are for use in liners which in turn are installed in the jig. They are used where the bushings will wear out or become obsolete before the jig or where several bushings are to be interchangeable in one hole. They are usually made with a knurled head to facilitate removal.

There are "fixed" and "slip" milled notches combined on the head of renewable bushings. There is one type of renewable bushing, slip-fixed renewable.

(a) The fixed side of the renewable bushing is used with the intention of leaving it in place until worn out.

(b) The slip side of the renewable bushing is used with the intention of changing it frequently in a given size of liner. This side is most often used where two

or more operations requiring different inside diameters are performed in a single jig, such as where drilling is followed by reaming, tapping, spot facing, counterboring, or some other secondary operation. (See Fig. 2.)

3.3 Liner Bushings

Liner bushings are provided with and without heads and are permanently installed in a jig to receive the renewable bushings. They are sometimes called "master bushings." (See Fig. 2.)

3.4 Bushing Specifications

The dimensions and tolerances of jig bushings shall conform to the specifications given in the following tables and notes.

4 JIG BUSHING DESIGNATION SYSTEM

4.1 Type Bushing

Specify by letter.

PM: press fit, plain (also plain liner)

HM: press fit, headed (also headed liner)

SFM: renewable, slip-fixed

Carbide bushings should use the letter "C" after the type designation (e.g., a slip-fixed renewable carbide bushing would be designated SFMC).

4.2 Body Diameter

Specify body diameter in millimeters.

4.3 Body Length

Specify the effective length in millimeters.

4.4 Inside Diameter

Specify by inside diameter of hole size in millimeters (two-place decimal).

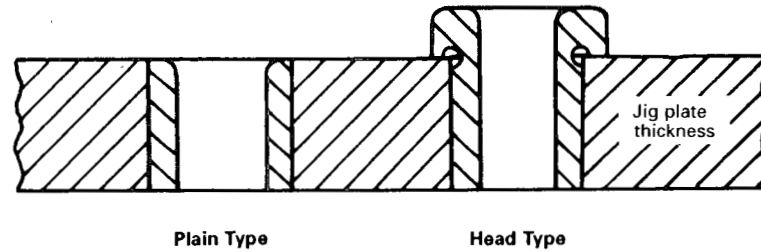


FIG. 1 PRESS FIT BUSHINGS

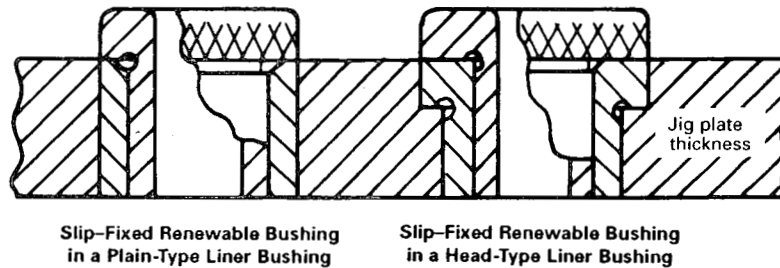


FIG. 2 RENEWABLE BUSHINGS AND LINER BUSHINGS

4.5 Example

SFM-8-12-4.50

Bushing type: SFM, renewable, slip-fixed

Body diameter: 8 mm

Body length: 12 mm

Inside diameter hole size: 4.50 mm

5 DESIGNATION SYSTEM FOR LOCKSCREWS AND CLAMPS

5.1 Letters "LSM" Denote Lockscrew

(a) LSM-1 Lockscrew for SFM bushings with 8 and 10 mm outside diameters (flush-mounted liner).

(b) LSM-2 Lockscrew for SFM bushings with 8 and 10 mm outside diameters (projected liner).

(c) LSM-3 Lockscrew for SFM bushings with 12, 15, and 18 mm outside diameters (flush-mounted liner).

(d) LSM-4 Lockscrew for SFM bushings with 12, 15, and 18 mm outside diameters (projected liner).

(e) LSM-5 Lockscrew for SFM bushings with 22, 26, 30, 35, and 42 mm outside diameters (flush-mounted liner).

(f) LSM-6 Lockscrew for SFM bushings with 22, 26, 30, 35, and 42 mm outside diameters (projected liner).

(g) LSM-7 Lockscrew for SFM bushings with 48 and 55 mm outside diameters (projected liner).

5.2 Letters "RCM" Denote Round Clamp

(a) RCM-1 Round clamp for SFM bushings with 8 and 10 mm diameters (flush-mounted liner).

(b) RCM-2 Round clamp for SFM bushings with 8 and 10 mm outside diameters (projected liner).

(c) RCM-3 Round clamp for FM bushings with 12, 15, and 18 mm outside diameters (flush-mounted liner).

(d) RCM-4 Round clamp for SFM bushings with 12, 15, and 18 mm outside diameters (projected liner).

(e) RCM-5 Round clamp for SFM bushings with 22, 26, 30, 35, and 42 mm outside diameters (flush-mounted liner).

(f) RCM-6 Round clamp for SFM bushings with 22, 26, 30, 35, and 42 mm outside diameters (projected liner).

(g) RCM-7 Round clamp for SFM bushings with 48 and 55 mm outside diameters (flush-mounted liner).

(h) RCM-8 Round clamp for SFM bushings with 48 and 55 mm outside diameters (projected liner).

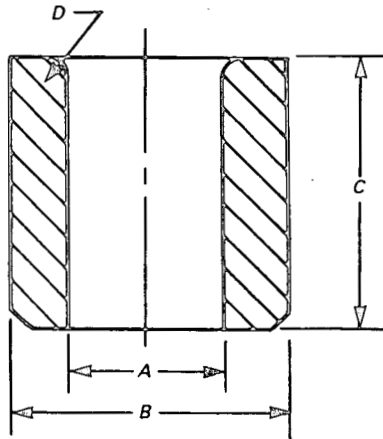


TABLE 1
PLAIN-TYPE PRESS FIT BUSHINGS (TYPE PM)

Range of Inside Diameters A (G6)	Body Diameter B (s6)			Overall Length C (±0.4)	Entrance Radius D (Min.)	Number
	Nominal	Max.	Min.			
0.35 to 1.80	4	4.027	4.019	6 9	0.4	PM-4-6 PM-4-9
1.81 to 2.60	5	5.027	5.019	6 9	0.4	PM-5-6 PM-5-9
2.61 to 3.30	6	6.027	6.019	8 12 16	0.4	PM-6-8 PM-6-12 PM-6-16
3.31 to 4.00	7	7.032	7.023	8 12 16	0.4	PM-7-8 PM-7-12 PM-7-16
4.01 to 5.00	8	8.032	8.023	8 12 16	0.8	PM-8-8 PM-8-12 PM-8-16
5.01 to 6.00	10	10.032	10.023	10 16 20	0.8	PM-10-10 PM-10-16 PM-10-20
6.01 to 8.00	12	12.039	12.028	10 16 20	0.8	PM-12-10 PM-12-16 PM-12-20
8.01 to 10.00	15	15.039	15.028	12 20 25	1.2	PM-15-12 PM-15-20 PM-15-25
10.01 to 12.00	18	18.039	18.028	12 20 25	1.2	PM-18-12 PM-18-20 PM-18-25

(Table continues on next page.)

TABLE 1
PLAIN-TYPE PRESS FIT BUSHINGS (TYPE PM) (CONT'D)

Range of Inside Diameters A (G6)	Body Diameter B (s6)			Overall Length C (±0.4)	Entrance Radius D (Min.)	Number
	Nominal	Max.	Min.			
12.01 to 15.00	22	22.048	2.035	16	1.6	PM-22-16
				28		PM-22-28
				36		PM-22-36
15.01 to 18.00	26	26.048	26.035	16	1.6	PM-26-16
				28		PM-26-28
				36		PM-26-36
18.01 to 22.00	30	30.048	30.035	20	1.6	PM-30-20
				36		PM-30-36
				45		PM-30-45
22.01 to 26.00	35	35.059	35.043	20	2.4	PM-35-20
				36		PM-35-36
				45		PM-35-45
26.01 to 30.00	42	42.059	42.043	25	2.4	PM-42-25
				45		PM-42-45
				56		PM-42-56
30.01 to 35.00	48	48.059	48.043	25	2.4	PM-48-25
				45		PM-48-45
				56		PM-48-56
35.01 to 42.00	55	55.072	55.053	30	2.4	PM-55-30
				56		PM-55-56
				67		PM-55-67
42.01 to 48.00	62	62.072	62.053	30	2.4	PM-62-30
				56		PM-62-56
				67		PM-62-67
48.01 to 55.00	70	70.078	70.059	30	3.0	PM-70-30
				56		PM-70-56
				67		PM-70-67

GENERAL NOTE:
See pg. 4 for specifications.

**SPECIFICATIONS FOR PLAIN- AND HEAD-
TYPE PRESS FIT BUSHINGS (Tables 1 and 2)**

- (a) All dimensions are given in millimeters.
- (b) Minimum and maximum inside diameter of bushing shall be in accordance with metric tolerance class G6:

Range of Inside Dia. of Bushing	Nominal Max.	Nominal Min.
0.35 to 3.00	+0.008	+0.002
3.01 to 6.00	+0.012	+0.004
6.01 to 10.00	+0.014	+0.005
10.01 to 18.00	+0.017	+0.006
18.01 to 30.00	+0.020	+0.007
30.01 to 50.00	+0.025	+0.009
50.01 to 55.00	+0.029	+0.010

JIG BUSHINGS (METRIC)

ASME B94.33.1-1997

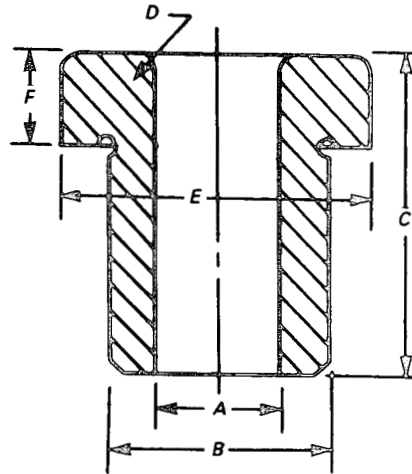


TABLE 2
HEAD-TYPE PRESS FIT BUSHINGS (TYPE HM)

Range of Inside Diameters A (G6)	Body Diameter B (s6)			Overall Length C (±0.4)	Entrance Radius D (Min.)	Head Diameter E (±0.4)	Head Thickness F (±0.4)	Number
	Nominal	Max.	Min.					
0.35 to 1.80	4	4.027	4.019	6 9	0.4	7	2	HM-4-6 HM-4-9
1.81 to 2.60	5	5.027	5.019	6 9	0.4	8	2	HM-5-6 HM-5-9
2.61 to 3.30	6	6.027	6.019	8 12 16	0.4	9	2.5	HM-6-8 HM-6-12 HM-6-16
3.31 to 4.00	7	7.032	7.023	8 12 16	0.4	10	2.5	HM-7-8 HM-7-12 HM-7-16
4.01 to 5.00	8	8.032	8.023	8 12 16	0.8	11	2.5	HM-8-8 HM-8-12 HM-8-16
5.01 to 6.00	10	10.032	10.023	10 16 20	0.8	13	3	HM-10-10 HM-10-16 HM-10-20
6.01 to 8.00	12	12.039	12.028	10 16 20	0.8	15	3	HM-12-10 HM-12-16 HM-12-20
8.01 to 10.00	15	15.039	15.028	12 20 25	1.2	18	3	HM-15-12 HM-15-20 HM-15-25
10.01 to 12.00	18	18.039	18.028	12 20 25	1.2	22	4	HM-18-12 HM-18-20 HM-18-25

(Table continues on next page.)

TABLE 2
HEAD-TYPE PRESS FIT BUSHINGS (TYPE HM) (CONT'D)

Range of Inside Diameters A (G6)	Body Diameter B (s6)			Overall Length C (±0.4)	Entrance Radius D (Min.)	Head Diameter E (±0.4)	Head Thickness F (±0.4)	Number
	Nominal	Max.	Min.					
12.01 to 15.00	22	22.048	22.035	16	1.6	26	4	HM-22-16
				28				HM-22-28
				36				HM-22-36
15.01 to 18.00	26	26.048	26.035	16	1.6	30	4	HM-26-16
				28				HM-26-28
				36				HM-26-36
18.01 to 22.00	30	30.048	30.035	20	1.6	34	5	HM-30-20
				36				HM-30-36
				45				HM-30-45
22.01 to 26.00	35	35.059	35.043	20	2.4	39	5	HM-35-20
				36				HM-35-36
				45				HM-35-45
26.01 to 30.00	42	42.059	42.043	25	2.4	46	5	HM-42-25
				45				HM-42-45
				56				HM-42-56
30.01 to 35.00	48	48.059	48.043	25	2.4	52	5	HM-48-25
				45				HM-48-45
				56				HM-48-56
35.01 to 42.00	55	55.072	55.053	30	2.4	59	5	HM-55-30
				56				HM-55-56
				67				HM-55-67
42.01 to 48.00	62	62.072	62.053	30	2.4	66	6	HM-62-30
				56				HM-62-56
				67				HM-62-67
48.01 to 55.00	70	70.078	70.059	30	3.0	74	6	HM-70-30
				56				HM-70-56
				67				HM-70-67

GENERAL NOTE:
See pg. 4 for specifications.

(c) Installation hole size shall be in accordance with metric tolerance class H7:

Range of Nominal Outside Dia. of Bushing	Nominal Max.	Nominal Min.
3	+0.010	+0
4 to 6	+0.012	+0
7 to 10	+0.015	+0
12 to 18	+0.018	+0
22 to 30	+0.021	+0
35 to 48	+0.025	+0
55 to 70	+0.030	+0

(d) The size and type of exit-end chamfer or lead

to be manufacturer's option.

(e) Head design and construction shall be in accordance with manufacturer's practice.

(f) Diameter A shall be concentric to diameter B within .012 TIR.

(g) Surface finish on diameter A shall be 0.4 micrometers or better.

(h) Hardness for steel bushings shall be 61–65 Rc.

(i) Material shall be the manufacturer's option.

(j) Small ID sizes through .80 mm may be counter-bored at manufacturer's option to provide for lubrication and chip clearance.

(k) Counterbore diameter shall be 1.00 mm, with 3

mm drill-bearing length.

(l) The included angle at the bottom of the counter-bore shall be 118 deg.

SPECIFICATIONS FOR SLIP-FIXED TYPE RENEWABLE BUSHINGS (Table 3)

(a) All dimensions are given in millimeters.

(b) Minimum and maximum inside diameter of bushing shall be in accordance with metric tolerance class G6:

Range of Inside Dia. of Bushing	Nominal Max.	Nominal Min.
0.35 to 3.00	+0.008	+0.002
3.01 to 6.00	+0.012	+0.004
6.01 to 10.00	+0.014	+0.005
10.01 to 18.00	+0.017	+0.006
18.01 to 30.00	+0.020	+0.007
30.01 to 50.00	+0.025	+0.009
50.01 to 55.00	+0.029	+0.010

(c) The size and type of exit-end chamfer or lead to be manufacturer's option.

(d) Head design and construction shall be in accordance with manufacturer's practice.

(e) Diameter A shall be concentric to diameter B within .012 TIR.

(f) Surface finish on diameter A shall be 0.4 micrometers or better.

(g) Hardness for steel bushings shall be 61–65 R_C.

(h) Material shall be the manufacturer's option.

(i) Small ID sizes through .80 mm may be counter-bored at manufacturer's option to provide for lubrication and chip clearance.

(j) Counterbore diameter shall be 1.00 mm, with 3 mm drill-bearing length.

(k) The included angle at the bottom of the counter-bore shall be 118 deg.

SPECIFICATIONS FOR PLAIN- AND HEAD-TYPE LINER BUSHINGS (Tables 4 and 5)

(a) All dimensions are given in millimeters.

(b) Minimum and maximum inside diameter of bushing shall be in accordance with metric tolerance class G6:

Range of Inside Dia. of Bushing	Nominal Max.	Nominal Min.
8.00 to 10.00	+0.014	+0.005
12.00 to 18.00	+0.017	+0.006
22.00 to 30.00	+0.020	+0.007
35.00 to 48.00	+0.025	+0.009
55.00	+0.029	+0.010

(c) Installation hole size shall be in accordance with metric tolerance class H7:

Range of Installation Hole Size	Nominal Max.	Nominal Min.
12 to 18	+0.018	+0
22 to 30	+0.021	+0
35 to 48	+0.025	+0
55 to 70	+0.030	+0

(d) The size and type of exit-end chamfer or lead to be manufacturer's option.

(e) Head design shall be in accordance with manufacturer's option.

(f) Diameter A shall be concentric to diameter B within .012 TIR.

(g) Surface finish on diameter A shall be 0.4 micrometers or better.

(h) Hardness for steel bushings shall be 61–65 R_C.

(i) Material shall be the manufacturer's option.

SPECIFICATIONS FOR LOCKSCREWS (Tables 6 and 7)

(a) All dimensions are given in millimeters.

(b) Material and hardness shall be the manufacturer's option.

Note: F dimension allows clearance to enable rotation of slip side of slip-fixed renewable bushings.

SPECIFICATIONS FOR ROUND CLAMPS (Tables 8 and 9)

(a) All dimensions are given in millimeters.

(b) Material and hardness shall be the manufacturer's option.

Note: F dimension allows clamping, without clearance; therefore, round clamps can only be used on the fixed side of a slip-fixed renewable bushing.

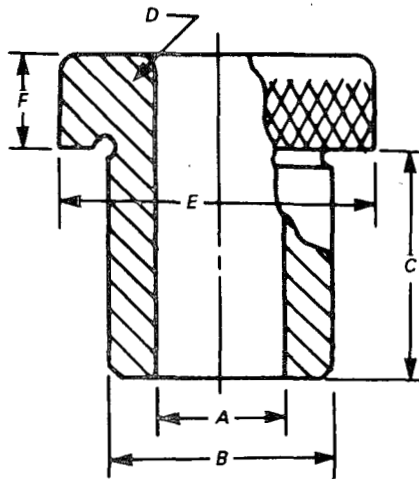


TABLE 3
SLIP-FIXED TYPE RENEWABLE BUSHINGS (TYPE SFM)

Range of Inside Diameters A (G6)	Body Diameter B (h5)			Body Length C (±0.4)	Entrance Radius D (Min.)	Head Diameter E (±0.4)	Head Thickness F (±0.4)	Number
	Nominal	Max.	Min.					
0.35 to 4.00	8	8.000	7.994	10 16	0.4	15	6	SFM-8-10 SFM-8-16
4.01 to 6.00	10	10.000	9.994	12 20 25	0.8	18	6	SFM-10-12 SFM-10-20 SFM-10-25
6.01 to 8.00	12	12.000	11.992	12 20 25	0.8	22	8	SFM-12-12 SFM-12-20 SFM-12-25
8.01 to 10.00	15	15.000	14.992	16 28 36	1.2	26	8	SFM-15-16 SFM-15-28 SFM-15-36
10.01 to 12.00	18	18.000	17.992	16 28 36	1.2	30	8	SFM-18-16 SFM-18-28 SFM-18-36
12.01 to 15.00	22	22.000	21.991	20 36 45	1.6	34	10	SFM-22-20 SFM-22-36 SFM-22-45
15.01 to 18.00	26	26.000	25.991	20 36 45	1.6	39	10	SFM-26-20 SFM-26-36 SFM-26-45
18.01 to 22.00	30	30.000	29.991	25 45 56	1.6	46	10	SFM-30-25 SFM-30-45 SFM-30-56
22.01 to 26.00	35	35.000	34.989	25 45 56	2.4	52	10	SFM-35-25 SFM-35-45 SFM-35-56

(Table continues on next page.)

TABLE 3
SLIP-FIXED TYPE RENEWABLE BUSHINGS (TYPE SFM) (CONT'D)

Range of Inside Diameters A (G6)	Body Diameter B (h5)			Body Length C (±0.4)	Entrance Radius D (Min.)	Head Diameter E (±0.4)	Head Thickness F (±0.4)	Number
	Nominal	Max.	Min.					
26.01 to 30.00	42	42.000	41.989	30	2.4	59	10	SFM-42-30
				56				SFM-42-56
				67				SFM-42-67
30.01 to 35.00	48	48.000	47.989	30	2.4	66	12	SFM-48-30
				56				SFM-48-56
				67				SFM-48-67
35.01 to 42.00	55	55.000	54.987	30	2.4	74	12	SFM-55-30
				56				SFM-55-56
				67				SFM-55-67

GENERAL NOTE:
 See pg. 7 for specifications.

(c) These clamps are located from the same point as the lockscrew (shown as "R" in the standards), therefore, the same locating jigs can be used to drill plus tap the necessary holes in the jig or fixture.

(d) To change to the round clamp in existing fixtures, remove the conventional lockscrew and use the same tapped hole to secure the new clamp with standard socket-head cap screw.

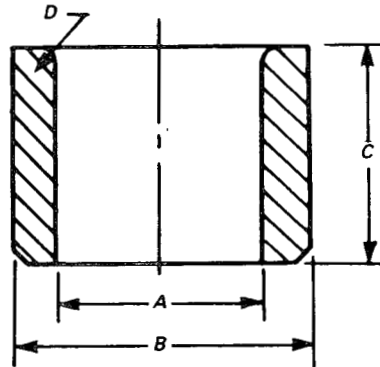


TABLE 4
PLAIN-TYPE LINER BUSHINGS (TYPE PM)

Inside Diameter A (G6)	Body Diameter B (s6)			Overall Length C (±0.4)	Entrance Radius D (Min.)	Number
	Nominal	Max.	Min.			
8	12	12.039	12.028	10	0.8	PM-12-10-8.00
				16		PM-12-16-8.00
10	15	15.039	15.028	12	1.2	PM-15-12-10.00
				20		PM-15-20-10.00
				25		PM-15-25-10.00
12	18	18.039	18.028	12	1.2	PM-18-12-12.00
				20		PM-18-20-12.00
				25		PM-18-25-12.00
15	22	22.048	22.035	16	1.6	PM-22-16-15.00
				28		PM-22-28-15.00
				36		PM-22-36-15.00
18	26	26.048	26.035	16	1.6	PM-26-16-18.00
				28		PM-26-28-18.00
				36		PM-26-36-18.00
22	30	30.048	30.035	20	1.6	PM-30-20-22.00
				36		PM-30-36-22.00
				45		PM-30-45-22.00
26	35	35.059	35.043	20	2.4	PM-35-20-26.00
				36		PM-35-36-26.00
				45		PM-35-45-26.00
30	42	42.059	42.043	25	2.4	PM-42-25-30.00
				45		PM-42-45-30.00
				56		PM-42-56-30.00
35	48	48.059	48.043	25	2.4	PM-48-25-35.00
				45		PM-48-45-35.00
				56		PM-48-56-35.00
42	55	55.072	55.053	30	2.4	PM-55-30-42.00
				56		PM-55-56-42.00
				67		PM-55-67-42.00

(Table continues on next page.)

TABLE 4
PLAIN-TYPE LINER BUSHINGS (TYPE PM) (CONT'D)

Inside Diameter A (G6)	Body Diameter B (s6)			Overall Length C (±0.4)	Entrance Radius D (Min.)	Number
	Nominal	Max.	Min.			
48	62	62.072	62.053	30	2.4	PM-62-30-48.00
				56		PM-62-56-48.00
				67		PM-62-67-48.00
55	70	70.078	70.059	30	3.0	PM-70-30-55.00
				56		PM-70-56-55.00
				67		PM-70-67-55.00

GENERAL NOTE:
 See pg. 7 for specifications.

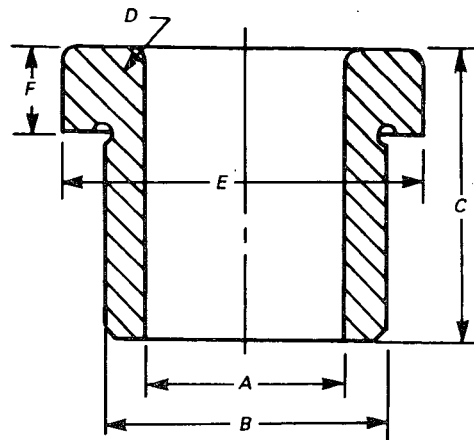


TABLE 5
HEAD-TYPE LINER BUSHINGS (TYPE HM)

Inside Diameter A (G6)	Body Diameter B (s6)			Overall Length C (±0.4)	Entrance Radius D (Min.)	Head Diameter E (±0.4)	Head Thickness F (±0.4)	Number
	Nominal	Max.	Min.					
8	12	12.039	12.028	10	0.8	15	3	HM-12-10-8.00
				16				HM-12-16-8.00
10	15	15.039	15.028	12	1.2	18	3	HM-15-12-10.00
				20				HM-15-20-10.00
				25				HM-15-25-10.00
12	18	18.039	18.028	12	1.2	22	4	HM-18-12-12.00
				20				HM-18-20-12.00
				25				HM-18-25-12.00
15	22	22.048	22.035	16	1.6	26	4	HM-22-16-15.00
				28				HM-22-28-15.00
				36				HM-22-36-15.00
18	26	26.048	26.035	16	1.6	30	4	HM-26-16-18.00
				28				HM-26-28-18.00
				36				HM-26-36-18.00
22	30	30.048	30.035	20	1.6	34	5	HM-30-20-22.00
				36				HM-30-36-22.00
				45				HM-30-45-22.00
26	35	35.059	35.043	20	2.4	39	5	HM-35-20-26.00
				36				HM-35-36-26.00
				45				HM-35-45-26.00
30	42	42.059	42.043	25	2.4	46	5	HM-42-25-30.00
				45				HM-42-45-30.00
				56				HM-42-56-30.00
35	48	48.059	48.043	25	2.4	52	5	HM-48-25-35.00
				45				HM-48-45-35.00
				56				HM-48-56-35.00

(Table continues on next page.)

TABLE 5
HEAD-TYPE LINER BUSHINGS (TYPE HM) (CONT'D)

Inside Diameter A (G6)	Body Diameter B (s6)			Overall Length C (±0.4)	Entrance Radius D (Min.)	Head Diameter E (±0.4)	Head Thickness F (±0.4)	Number
	Nominal	Max.	Min.					
42	55	55.072	55.053	30	2.4	59	5	HM-55-30-42.00
				56				HM-55-56-42.00
				67				HM-55-67-42.00
48	62	62.072	62.053	30	2.4	66	6	HM-62-30-48.00
				56				HM-62-56-48.00
				67				HM-62-67-48.00
55	70	70.078	70.059	30	3.0	74	6	HM-70-30-55.00
				56				HM-70-56-55.00
				67				HM-70-67-55.00

GENERAL NOTE:
See pg. 7 for specifications.

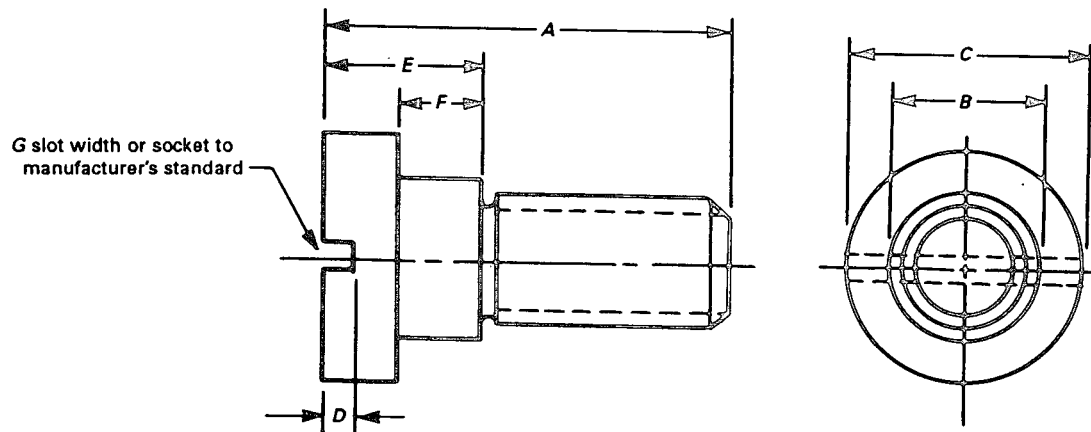


TABLE 6
LOCKSCREWS FOR STANDARD MOUNTING OF SLIP-FIXED RENEWABLE BUSHINGS

SFM Bushing Body Diameter	Overall Length A (±0.4)	Shoulder Diameter B (±0.4)	Head Diameter C (±0.4)	Slot Depth D (±0.4)	Height Including Head E (±0.4)	Height Under Head F (+0.4/+0.2)	Slot Width G (±0.4)	Thread	Number
8 to 10	15	7.5	13	2	6	3	1.6	M5 × 0.8	LSM-1
12 to 18	18	9.5	16	2.5	8	4	2	M6 × 1	LSM-3
22 to 42	22	12	20	3	10	5.5	2.5	M8 × 1.25	LSM-5
48 to 55	32	15	24	3	12	7	2.5	M10 × 1.5	LSM-7

TABLE 7
LOCKSCREWS FOR PROJECTED MOUNTING OF SLIP-FIXED RENEWABLE BUSHINGS

SFM Bushing Body Diameter	Overall Length A (± 0.4)	Shoulder Diameter B (± 0.4)	Head Diameter C (± 0.4)	Slot Depth D (± 0.4)	Height Including Head E (± 0.4)	Height Under Head F ($+0.4/+0.2$)	Slot Width G (± 0.4)	Thread	Number
8 to 10	18	7.5	13	2	9	6	16	M5 \times 0.8	LSM-2
12 to 18	22	9.5	16	2.5	12	8	2	M6 \times 1	LSM-4
22 to 42	27	12	20	3	15	10.5	2.5	M8 \times 1.25	LSM-6
48 to 55	38	15	24	3	18	13	2.5	M10 \times 1.5	LSM-8

GENERAL NOTE:
See pg. 7 for specifications.

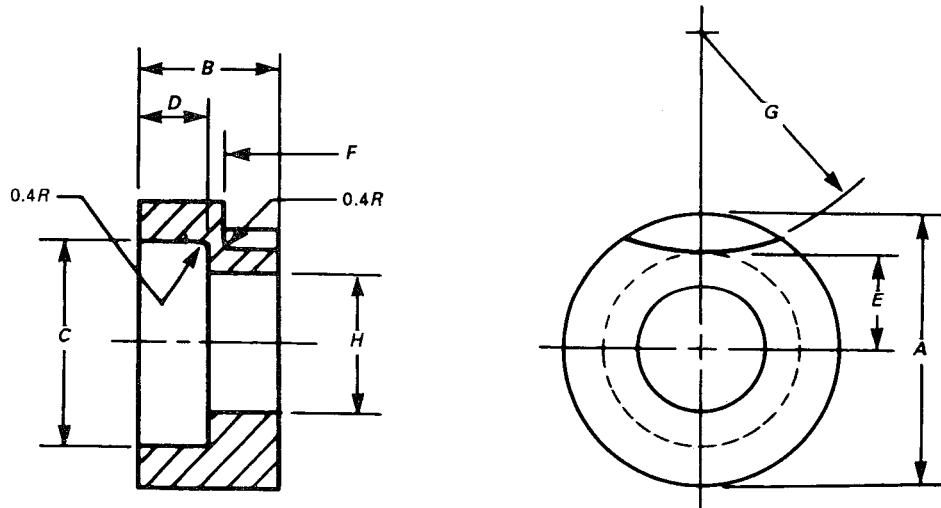


TABLE 8
OPTIONAL ROUND CLAMPS FOR STANDARD MOUNTING OF SLIP-FIXED RENEWABLE BUSHINGS

SFM Bushing Body Diameter	Outside Diameter A (± 0.4)	Overall Height B (± 0.4)	Counterbore Diameter C (± 0.4)	Counterbore Depth D (± 0.4)	Slot Distance E (± 0.4)	Clamping Height F ($-0/+0.25$)	Radius G (± 0.4)	Hole Diameter H (± 0.2)	Use with Socket-Head Cap Screw	Number
8 to 10	13	8	10	4	3.7	3	9.5	5.4	M5 \times 0.8	RCM-1
12 to 18	16	10	12	5	4.7	4	15	6.4	M6 \times 1	RCM-3
22 to 42	20	12	15	5	6.2	5.5	30	8.4	M8 \times 1.25	RCM-5
48 to 55	24	16	18	7	7.5	7	80	10.5	M10 \times 1.5	RCM-7

TABLE 9
OPTIONAL ROUND CLAMPS FOR PROJECTED MOUNTING OF SLIP-FIXED RENEWABLE BUSHINGS

SFM Bushing Body Diameter	Outside Diameter A (± 0.4)	Overall Height B (± 0.4)	Counterbore Diameter C (± 0.4)	Counterbore Depth D (± 0.4)	Slot Distance E (± 0.4)	Clamping Height F ($-0/+0.25$)	Radius G (± 0.4)	Hole Diameter H (± 0.2)	Use with Socket-Head Cap Screw	Number
8 to 10	13	11	10	4	3.7	6	9.5	5.4	M5 \times 0.8	RCM-2
12 to 18	16	14	12	5	4.7	8	15	6.4	M6 \times 1	RCM-4
22 to 42	20	17	15	5	6.2	10.5	30	8.4	M8 \times 1.25	RCM-6
48 to 55	24	22	18	7	7.5	13	80	10.5	M10 \times 1.5	RCM-8

GENERAL NOTE:

See pg. 7 for specifications.

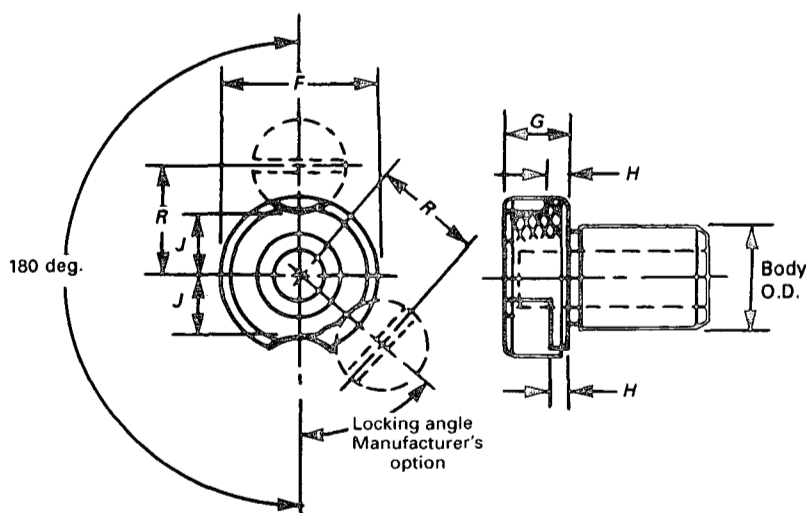


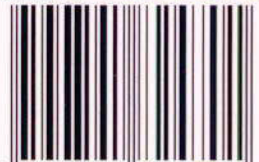
TABLE 10
LOCKING-MECHANISM DIMENSIONS OF SLIP-FIXED RENEWABLE BUSHINGS

Body Diameter	Head Diameter F (± 0.4)	Head Thickness G (± 0.4)	Slot Height H (± 0.13)	Slot Distance J (± 0.4)	Mounting Location R (± 0.4)	Lockscrews or Round Clamps
8	15	6	3	4.5	11.5	LSM-1, LSM-2, RCM-1, RCM-2
10	18	6	3	6	13	LSM-1, LSM-2, RCM-1, RCM-2
12	22	8	4	7.5	16	LSM-3, LSM-4, RCM-3, RCM-4
15	26	8	4	9.5	18	LSM-3, LSM-4, RCM-3, RCM-4
18	30	8	4	11.5	20	LSM-3, LSM-4, RCM-3, RCM-4
22	34	10	5.5	13	23.5	LSM-5, LSM-6, RCM-5, RCM-6
26	39	10	5.5	15.5	26	LSM-5, LSM-6, RCM-5, RCM-6
30	46	10	5.5	19	29.5	LSM-5, LSM-6, RCM-5, RCM-6
35	52	10	5.5	22	32.5	LSM-5, LSM-6, RCM-5, RCM-6
42	59	10	5.5	25.5	36	LSM-5, LSM-6, RCM-5, RCM-6
48	66	12	7	28.5	41	LSM-7, LSM-8, RCM-7, RCM-8
55	74	12	7	32.5	45	LSM-7, LSM-8, RCM-7, RCM-8

TABLE 11
STANDARD METRIC DRILL SIZES

0.35	2.70	6.80	13.50
0.38	2.75	6.90	14.00
0.40	2.80	7.00	14.50
0.42	2.90	7.10	15.00
0.45	3.00	7.20	15.50
0.48	3.10	7.25	16.00
0.50	3.20	7.30	16.50
0.55	3.25	7.40	17.00
0.60	3.30	7.50	17.50
0.65	3.40	7.60	18.00
0.70	3.50	7.70	18.50
0.75	3.60	7.75	19.00
0.80	3.70	7.80	19.50
0.85	3.75	7.90	20.00
0.90	3.80	8.00	20.50
0.95	3.90	8.10	21.00
1.00	4.00	8.20	21.50
1.05	4.10	8.25	22.00
1.10	4.20	8.30	22.50
1.15	4.25	8.40	23.00
1.20	4.30	8.50	23.50
1.25	4.40	8.60	24.00
1.30	4.50	8.70	24.50
1.35	4.60	8.75	25.00
1.40	4.70	8.80	26.00
1.45	4.75	8.90	27.00
1.50	4.80	9.00	28.00
1.55	4.90	9.10	29.00
1.60	5.00	9.20	30.00
1.65	5.10	9.25	31.00
1.70	5.20	9.30	32.00
1.75	5.25	9.40	33.00
1.80	5.30	9.50	34.00
1.85	5.40	9.60	35.00
1.90	5.50	9.70	36.00
1.95	5.60	9.75	37.00
2.00	5.70	9.80	38.00
2.05	5.75	9.90	39.00
2.10	5.80	10.00	40.00
2.15	5.90	10.20	41.00
2.20	6.00	10.50	42.00
2.25	6.10	10.80	43.00
2.30	6.20	11.00	44.00
2.35	6.25	11.20	45.00
2.40	6.30	11.50	46.00
2.45	6.40	11.80	47.00
2.50	6.50	12.00	48.00
2.55	6.60	12.20	50.00
2.60	6.70	12.50	55.00
2.65	6.75	13.00	

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