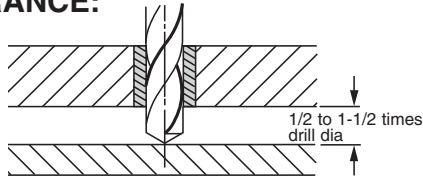
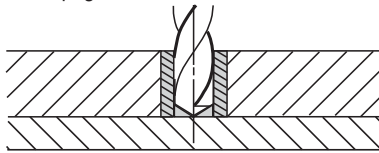


## INSTALLATION AND TECHNICAL DATA

### RECOMMENDED CHIP CLEARANCE:

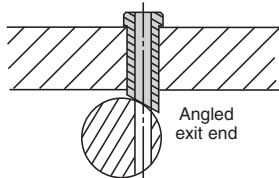


To minimize drill bending and maximize hole accuracy, mount drill bushings as close to the workpiece as possible while still allowing adequate chip clearance. The necessary clearance depends on workpiece material and chip stringiness. For example, cast iron, with fine chips requires about 1/2 times drill diameter for chip clearance. Materials that produce long, stringy chips, such as cold-rolled steel and aluminum, require at least one-drill-diameter clearance. To reduce clearance even with long, stringy chips, exit-end chip breakers are available...see pages 542-543.



Direct workpiece contact is usually not recommended. Chips can escape only up through the drill's flutes, drill-bearing length is shortened by the drill point's length, and drill-withdrawal burrs can raise the jig plate. Direct contact may be necessary, though, for maximum bearing length when drilling sloped surfaces (see below). Also, reamer bushings can be mounted much closer than drill bushings, due to much finer chips, for more-accurate hole finishing.

### SLOPED WORKPIECE SURFACES:



Whenever the drilling axis is not perpendicular to the workpiece surface, locate the exit end as close to the part as possible. Otherwise the drill will tend to wander. For maximum drill guiding, we recommend specifying bushings with an angle milled on the exit end, tangent to the workpiece surface at point of entry.

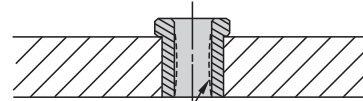
### SPECIAL BUSHINGS FOR CLOSE HOLE SPACING:

When holes are located close together, special bushings are sometimes required. Thinwall bushings, where the bushing ID is larger than the normal ID range for a given OD, are often a good solution. Holes for thinwall bushings must be

very accurate and round, because these bushings are more easily distorted. For very-close hole spacing, especially with headed bushings, specify bushings with ground flats.



### INSTALLATION-HOLE PREPARATION:



Excessive interference causes bellmouthing

To avoid jig-plate or bushing distortion, do not use excessive interference fits on press-fit bushings. See table below for recommended hole sizes in unhardened steel or cast iron jig plates. Always prepare installation holes using a jig borer or reamer. Standard chucking reamers (with a plus tolerance) usually produce installation holes to the tolerances shown in the table. Other factors to consider are: (1) headed bushings require less interference to resist drilling thrust; (2) longer bushings in thick plates require less interference; (3) bushings with thinner walls are more prone to distortion; (4) less-ductile jig-plate materials require less interference.

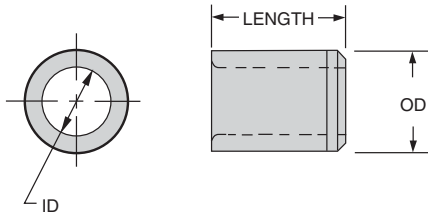
#### METRIC

PRESS-FIT BUSHING OD		RECOMMENDED HOLE SIZE
NOM.	ACTUAL (±6)	(H7)
3mm	3.020-3.014mm	3.000-3.010mm
4mm	4.027-4.019mm	4.000-4.012mm
5mm	5.027-5.019mm	5.000-5.012mm
6mm	6.027-6.019mm	6.000-6.012mm
7mm	7.032-7.023mm	7.000-7.015mm
8mm	8.032-8.023mm	8.000-8.015mm
10mm	10.032-10.023mm	10.000-10.015mm
12mm	12.039-12.028mm	12.000-12.018mm
15mm	15.039-15.028mm	15.000-15.018mm
18mm	18.039-18.028mm	18.000-18.018mm
22mm	22.048-22.035mm	22.000-22.021mm
26mm	26.048-26.035mm	26.000-26.021mm
30mm	30.048-30.035mm	30.000-30.021mm
35mm	35.059-35.043mm	35.000-35.025mm
42mm	42.059-42.043mm	42.000-42.025mm
48mm	48.059-48.043mm	48.000-48.025mm
55mm	55.072-55.053mm	55.000-55.030mm
62mm	62.072-62.053mm	62.000-62.030mm
70mm	70.078-70.059mm	70.000-70.030mm
78mm	78.078-78.059mm	78.000-78.030mm
85mm	85.093-85.071mm	85.000-85.035mm
95mm	95.093-95.071mm	95.000-95.035mm
105mm	105.101-105.079mm	105.000-105.035mm
115mm	115.101-115.079mm	115.000-115.035mm
125mm	125.117-125.092mm	125.000-125.040mm

#### USA

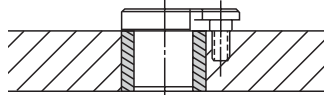
PRESS-FIT BUSHING OD		RECOMMENDED HOLE SIZE
NOM.	ACTUAL	SIZE
5/32	.1578-.1575	.1565-.1570
3/16	.1891-.1888	.1880-.1883
13/64	.2046-.2043	.2037-.2040
1/4	.2516-.2513	.2507-.2510
5/16	.3141-.3138	.3132-.3135
3/8	.3766-.3763	.3757-.3760
13/32	.4078-.4075	.4069-.4072
7/16	.4392-.4389	.4382-.4385
1/2	.5017-.5014	.5007-.5010
9/16	.5642-.5639	.5632-.5635
5/8	.6267-.6264	.6257-.6260
3/4	.7518-.7515	.7507-.7510
7/8	.8768-.8765	.8757-.8760
1	1.0018-1.0015	1.0007-1.0010
1-1/8	1.1270-1.1267	1.1257-1.1260
1-1/4	1.2520-1.2517	1.2507-1.2510
1-3/8	1.3772-1.3768	1.3757-1.3760
1-1/2	1.5021-1.5018	1.5007-1.5010
1-3/4	1.7523-1.7519	1.7507-1.7510
2-1/4	2.2525-2.2521	2.2507-2.2510
2-3/4	2.7526-2.7522	2.7507-2.7510

## L LINER

### APPLICATIONS:

Liners are permanent bushings used to hold renewable drill bushings. The liner's ID has a precise sliding fit with the renewable bushing's OD. The hardened liner accurately locates the renewable bushing and protects the jig plate from wear caused by frequent bushing replacement. Note: Metric liner bushings are the same as metric press-fit bushings.



### ORDERING EXAMPLES:

L-32-16 Standard USA liner bushing  
L-32-16U Unground OD  
L-40-16-24 Standard USA liner bushing with a choice of ID in that OD size  
PM-18-25-12.00 Standard metric liner bushing (same as metric press-fit type)

Prices shown here apply to standard bushings only, either ground or unground OD, for a standard ID size.

### STANDARD LINER ID TOLERANCES:

3/16 to 3/8"	+0.001/+0.0004	8 to 10mm	+0.005/+0.014mm
7/16 to 5/8"	+0.002/+0.0005	12 to 18mm	+0.006/+0.017mm
3/4"	+0.003/+0.0006	22 to 30mm	+0.007/+0.020mm
7/8 to 1"	+0.004/+0.0007	35 to 48mm	+0.009/+0.025mm
1-3/8"	+0.006/+0.0010	55 to 78mm	+0.010/+0.029mm
1-3/4"	+0.008/+0.0012	85 to 105mm	+0.012/+0.034mm
2-1/4"	+0.010/+0.0015		(G6 tolerance)

ID	OD	LENGTH	ANSI PART NO.	PRICE 1-5
3/16	5/16 .3141-.3138 (.327-.322 UNG)	1/4	L-20-4	Please see our web catalog for pricing.
		5/16	L-20-5	
		3/8	L-20-6	
		1/2	L-20-8	
		5/8	L-20-10	
		3/4	L-20-12	
1/4	7/16 .4392-.4389 (.453-.448 UNG)	1/4	L-28-4	
		5/16	L-28-5	
		3/8	L-28-6	
		1/2	L-28-8	
		5/8	L-28-10	
		3/4	L-28-12	

ID	OD	LENGTH	ANSI PART NO.	PRICE 1-5
5/16	1/2 .5017-.5014 (.520-.515 UNG)	1/4	L-32-4	Please see our web catalog for pricing.
		5/16	L-32-5	
		3/8	L-32-6	
		1/2	L-32-8	
		5/8	L-32-10	
		3/4	L-32-12	
		1	L-32-16	
		1-3/8	L-32-22	
		1/4	L-36-4	
		5/16	L-36-5	
		3/8	L-36-6	
		1/2	L-36-8	
		5/8	L-36-10	
		3/4	L-36-12	
3/8	5/8 .5642-.5639 (.582-.577 UNG)	1	L-36-16	
		1/4	L-36-4	
		5/16	L-36-5	
		3/8	L-36-6	
		1/2	L-36-8	
		5/8	L-36-10	
		3/4	L-36-12	
		1	L-36-16	
		1/4	L-40-4-24	
		5/16	L-40-5-24	
		3/8	L-40-6-24	
		1/2	L-40-8-24	
		5/8	L-40-10-24	
		3/4	L-40-12-24	
7/16	5/8 .6267-.6264 (.645-.640 UNG)	1	L-40-16-24	
		1/4	L-40-4-28	
		5/16	L-40-5-28	
		3/8	L-40-6-28	
		1/2	L-40-8-28	
		5/8	L-40-10-28	
		3/4	L-40-12-28	
		1	L-40-16-28	
		5/16	L-48-5	
		3/8	L-48-6	
		1/2	L-48-8	
		3/4	L-48-12	
		1	L-48-16	
		1-3/8	L-48-22	
1-1/2	L-48-24			
9/16	3/4 .7518-.7515 (.770-.765 UNG)	1-3/4	L-48-28	
		2-1/8	L-48-34	
		5/16	L-56-5-36	
		3/8	L-56-6-36	
		1/2	L-56-8-36	
		5/8	L-56-10-36	
		3/4	L-56-12-36	
		1	L-56-16-36	
		1-1/4	L-56-20-36	
		5/16	L-56-5-40	
		3/8	L-56-6-40	
		1/2	L-56-8-40	
		5/8	L-56-10-40	
		3/4	L-56-12-40	
1	L-56-16-40			
5/8	7/8 .8768-.8765 (.895-.890 UNG)	1-1/4	L-56-20-40	
		5/16	L-56-5-40	
		3/8	L-56-6-40	
		1/2	L-56-8-40	
		5/8	L-56-10-40	
		3/4	L-56-12-40	
		1	L-56-16-40	
		1-1/4	L-56-20-40	

### QUANTITY DISCOUNTS

Quantity	1	6	12	24	50	100	200	500
	-5	-11	-23	-49	-99	-199	-499	Up
Discount %	Net	18%	29%	34%	42%	48%	50%	52%
Multiplier	1.00	.82	.71	.66	.58	.52	.50	.48



## LINER

# L

ID	OD	LENGTH	ANSI PART NO.	PRICE 1-5
3/4	1 1.0018-1.0015 (1.020-1.015 UNG)	1/2	L-64-8	Please see our web catalog for pricing.
		3/4	L-64-12	
		1	L-64-16	
		1-3/8	L-64-22	
		1-1/2	L-64-24	
		1-3/4	L-64-28	
		2-1/8	L-64-34	
		2-1/2	L-64-40	
		3	L-64-48	
7/8	1-1/4 1.2520-1.2517 (1.270-1.265 UNG)	1/2	L-80-8	
		5/8	L-80-10	
		3/4	L-80-12	
		1	L-80-16	
		1-1/4	L-80-20	
		1-1/2	L-80-24	
1	1-3/8 1.3772-1.3768 (1.395-1.390 UNG)	1/2	L-88-8	
		3/4	L-88-12	
		1	L-88-16	
		1-3/8	L-88-22	
		1-1/2	L-88-24	
		1-3/4	L-88-28	
		2-1/8	L-88-34	
		2-1/2	L-88-40	
1-3/8	1-3/4 1.7523-1.7519 (1.770-1.765 UNG)	3	L-88-48	
		3/4	L-112-12	
		1	L-112-16	
		1-3/8	L-112-22	
		1-1/2	L-112-24	
		1-3/4	L-112-28	
		2-1/8	L-112-34	
		2-1/2	L-112-40	
1-3/4	2-1/4 2.2525-2.2521 (2.270-2.265 UNG)	3	L-112-48	
		3/4	L-144-12	
		1	L-144-16	
		1-3/8	L-144-22	
		1-1/2	L-144-24	
		1-3/4	L-144-28	
		2-1/8	L-144-34	
		2-1/2	L-144-40	
2-1/4	2-3/4 2.7526-2.7522 (2.770-2.765 UNG)	3	L-144-48	
		3/4	L-176-12	
		1	L-176-16	
		1-3/8	L-176-22	
		1-1/2	L-176-24	
		1-3/4	L-176-28	
		2-1/8	L-176-34	
		2-1/2	L-176-40	
		3	L-176-48	

For extended-range bushings (larger sizes) please see our web catalog.

### QUANTITY DISCOUNTS

Quantity	1	6	12	24	50	100	200	500
	-5	-11	-23	-49	-99	-199	-499	Up
Discount %	Net	18%	29%	34%	42%	48%	50%	52%
Multiplier	1.00	.82	.71	.66	.58	.52	.50	.48

## PM LINER METRIC

ID (G6)	OD (s6)	LENGTH	ANSI PART NO.	PRICE 1-5
8mm	12mm 12.039-12.028mm	10mm	PM-12-10-8.00	Please see our web catalog for pricing.
		16mm	PM-12-16-8.00	
10mm	15mm 15.039-15.028mm	12mm	PM-15-12-10.00	
		20mm	PM-15-20-10.00	
		25mm	PM-15-25-10.00	
12mm	18mm 18.039-18.028mm	12mm	PM-18-12-12.00	
		20mm	PM-18-20-12.00	
		25mm	PM-18-25-12.00	
15mm	22mm 22.048-22.035mm	16mm	PM-22-16-15.00	
		28mm	PM-22-28-15.00	
		36mm	PM-22-36-15.00	
18mm	26mm 26.048-26.035mm	16mm	PM-26-16-18.00	
		28mm	PM-26-28-18.00	
		36mm	PM-26-36-18.00	
22mm	30mm 30.048-30.035mm	20mm	PM-30-20-22.00	
		36mm	PM-30-36-22.00	
		45mm	PM-30-45-22.00	
26mm	35mm 35.059-35.043mm	20mm	PM-35-20-26.00	
		36mm	PM-35-36-26.00	
		45mm	PM-35-45-26.00	
30mm	42mm 42.059-42.043mm	25mm	PM-42-25-30.00	
		45mm	PM-42-45-30.00	
		56mm	PM-42-56-30.00	
35mm	48mm 48.059-48.043mm	25mm	PM-48-25-35.00	
		45mm	PM-48-45-35.00	
		56mm	PM-48-56-35.00	
42mm	55mm 55.072-55.053mm	30mm	PM-55-30-42.00	
		56mm	PM-55-56-42.00	
		67mm	PM-55-67-42.00	
48mm	62mm 62.072-62.053mm	30mm	PM-62-30-48.00	
		56mm	PM-62-56-48.00	
		67mm	PM-62-67-48.00	
55mm	70mm 70.078-70.059mm	30mm	PM-70-30-55.00	
		56mm	PM-70-56-55.00	
		67mm	PM-70-67-55.00	
62mm	78mm 78.078-78.059mm	35mm	PM-78-35-62.00	
		67mm	PM-78-67-62.00	
		78mm	PM-78-78-62.00	

ID (G6)	OD (s6)	LENGTH	ANSI PART NO.	PRICE 1-5
70mm	85mm 85.093-85.071mm	35mm	PM-85-35-70.00	Please see our web catalog for pricing.
		67mm	PM-85-67-70.00	
		78mm	PM-85-78-70.00	
78mm	95mm 95.093-95.071mm	40mm	PM-95-40-78.00	
		78mm	PM-95-78-78.00	
		105mm	PM-95-105-78.00	
85mm	105mm 105.101-105.079mm	40mm	PM-105-40-85.00	
		78mm	PM-105-78-85.00	
		105mm	PM-105-105-85.00	
95mm	115mm 115.101-115.079mm	45mm	PM-115-45-95.00	
		89mm	PM-115-89-95.00	
		112mm	PM-115-112-95.00	
105mm	125mm 125.117-125.092mm	45mm	PM-125-45-105.00	
		89mm	PM-125-89-105.00	
		112mm	PM-125-112-105.00	

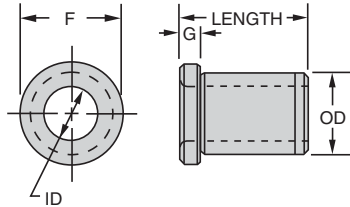
Note: Metric liner bushings are the same as metric press-fit bushings.

### QUANTITY DISCOUNTS

Quantity	1	6	12	24	50	100	200	500
	-5	-11	-23	-49	-99	-199	-499	Up
Discount %	Net	18%	29%	34%	42%	48%	50%	52%
Multiplier	1.00	.82	.71	.66	.58	.52	.50	.48



## HEAD LINER HL



### USA

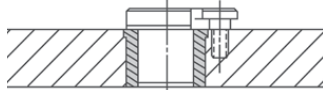
BODY OD	F DIA	G
1/2	5/8	3/32
3/4	7/8	3/32
1	1-1/8	1/8
1-3/8	1-1/2	1/8
1-3/4	1-7/8	3/16
2-1/4	2-3/8	3/16
2-3/4	2-7/8	3/16

### METRIC

BODY OD	F DIA	G
12mm	15mm	3mm
15mm	18mm	3mm
18mm	22mm	4mm
22mm	26mm	4mm
26mm	30mm	4mm
30mm	34mm	5mm
35mm	39mm	5mm
42mm	46mm	5mm
48mm	52mm	5mm
55mm	59mm	5mm
62mm	66mm	6mm
70mm	74mm	6mm
78mm	82mm	6mm
85mm	90mm	6mm
95mm	100mm	6mm
105mm	110mm	6mm
115mm	120mm	6mm
125mm	130mm	6mm

### APPLICATIONS:

Similar to an L bushing, but with a head to resist heavy axial loads. Head liners are permanent bushings used to hold renewable drill bushings. The head liner's ID has a precise sliding fit with the renewable bushing's OD. The hardened head liner accurately locates the renewable bushing and protects the jig plate from wear caused by frequent bushing replacement. Note: The "length" listed for a head liner refers to its overall length, not its length under the head. Metric head-liner bushings are the same as metric head-press-fit bushings.



### ORDERING EXAMPLES:

HL-32-16 Standard USA liner bushing  
HL-32-16U Unground OD  
HM-18-25-12.00 Standard metric liner bushing (same as metric press-fit type)

Prices shown here apply to standard bushings only, either ground or unground OD, for a standard ID size.

### STANDARD LINER ID TOLERANCES:

5/16"	+.0001/-.0004	8 to 10mm	+.005/+.014mm
1/2"	+.0002/+.0005	12 to 18mm	+.006/+.017mm
3/4"	+.0003/+.0006	22 to 30mm	+.007/+.020mm
1"	+.0004/+.0007	35 to 48mm	+.009/+.025mm
1-3/8"	+.0006/+.0010	55 to 78mm	+.010/+.029mm
1-3/4"	+.0008/+.0012	85 to 105mm	+.012/+.034mm
2-1/4"	+.0010/+.0015		(G6 tolerance)


ID	OD	LENGTH	ANSI PART NO.	PRICE 1-5
5/16	1/2 .5017-.5014 (.520-.515 UNG)	5/16	HL-32-5	
		3/8	HL-32-6	
		1/2	HL-32-8	
		3/4	HL-32-12	
		1	HL-32-16	
1/2	3/4 .7518-.7515 (.770-.765 UNG)	1-3/8	HL-32-22	
		5/16	HL-48-5	
		3/8	HL-48-6	
		1/2	HL-48-8	
		3/4	HL-48-12	
		1	HL-48-16	
		1-3/8	HL-48-22	
3/4	1 1.0018-1.0015 (1.020-1.015 UNG)	1-1/2	HL-48-24	
		1-3/4	HL-48-28	
		2-1/8	HL-48-34	
		1/2	HL-64-8	
		3/4	HL-64-12	
		1	HL-64-16	
		1-3/8	HL-64-22	
		1-1/2	HL-64-24	
		1-3/4	HL-64-28	
		2-1/8	HL-64-34	
1	1-3/8 1.3772-1.3768 (1.395-1.390 UNG)	2-1/2	HL-64-40	
		3	HL-64-48	
		1/2	HL-88-8	
		3/4	HL-88-12	
		1	HL-88-16	
		1-3/8	HL-88-22	
		1-1/2	HL-88-24	
1-3/8	1-3/4 1.7523-1.7519 (1.770-1.765 UNG)	1-3/4	HL-88-28	
		2-1/8	HL-88-34	
		2-1/2	HL-88-40	
		3	HL-88-48	
		3/4	HL-112-12	
		1	HL-112-16	
1-3/4	2-1/4 2.2525-2.2521 (2.270-2.265 UNG)	1-3/8	HL-112-22	
		1-1/2	HL-112-24	
		1-3/4	HL-112-28	
		2-1/8	HL-112-34	
		2-1/2	HL-112-40	
		3	HL-112-48	
		3/4	HL-144-12	
1-3/4	2-3/4 2.7526-2.7522 (2.770-2.765 UNG)	1	HL-144-16	
		1-3/8	HL-144-22	
		1-1/2	HL-144-24	
		1-3/4	HL-144-28	
		2-1/8	HL-144-34	
		2-1/2	HL-144-40	
2-1/4		3	HL-144-48	
		3/4	HL-176-12	
		1	HL-176-16	
		1-3/8	HL-176-22	
		1-1/2	HL-176-24	
		1-3/4	HL-176-28	
		2-1/8	HL-176-34	
2-1/2	HL-176-40			
3	HL-176-48			

Please see our web catalog for pricing.

### QUANTITY DISCOUNTS

Quantity	1	6	12	24	50	100	200	500
	-5	-11	-23	-49	-99	-199	-499	Up
Discount %	Net	18%	29%	34%	42%	48%	50%	52%
Multiplier	1.00	.82	.71	.66	.58	.52	.50	.48

## HM HEAD LINER METRIC



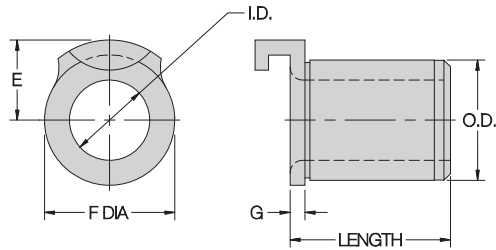
ID (G6)	OD (s6)	LENGTH	ANSI PART NO.	PRICE 1-5
8mm	12mm 12.039-12.028mm	10mm	HM-12-10-8.00	Please see our web catalog for pricing.
		16mm	HM-12-16-8.00	
10mm	15mm 15.039-15.028mm	12mm	HM-15-12-10.00	
		20mm	HM-15-20-10.00	
		25mm	HM-15-25-10.00	
12mm	18mm 18.039-18.028mm	12mm	HM-18-12-12.00	
		20mm	HM-18-20-12.00	
		25mm	HM-18-25-12.00	
15mm	22mm 22.048-22.035mm	16mm	HM-22-16-15.00	
		28mm	HM-22-28-15.00	
		36mm	HM-22-36-15.00	
18mm	26mm 26.048-26.035mm	16mm	HM-26-16-18.00	
		28mm	HM-26-28-18.00	
		36mm	HM-26-36-18.00	
22mm	30mm 30.048-30.035mm	20mm	HM-30-20-22.00	
		36mm	HM-30-36-22.00	
		45mm	HM-30-45-22.00	
26mm	35mm 35.059-35.043mm	20mm	HM-35-20-26.00	
		36mm	HM-35-36-26.00	
		45mm	HM-35-45-26.00	
30mm	42mm 42.059-42.043mm	25mm	HM-42-25-30.00	
		45mm	HM-42-45-30.00	
		56mm	HM-42-56-30.00	
35mm	48mm 48.059-48.043mm	25mm	HM-48-25-35.00	
		45mm	HM-48-45-35.00	
		56mm	HM-48-56-35.00	
42mm	55mm 55.072-55.053mm	30mm	HM-55-30-42.00	
		56mm	HM-55-56-42.00	
		67mm	HM-55-67-42.00	
48mm	62mm 62.072-62.053mm	30mm	HM-62-30-48.00	
		56mm	HM-62-56-48.00	
		67mm	HM-62-67-48.00	
55mm	70mm 70.078-70.059mm	30mm	HM-70-30-55.00	
		56mm	HM-70-56-55.00	
		67mm	HM-70-67-55.00	
62mm	78mm 78.078-78.059mm	35mm	HM-78-35-62.00	
		67mm	HM-78-67-62.00	
		78mm	HM-78-78-62.00	

ID (G6)	OD (s6)	LENGTH	ANSI PART NO.	PRICE 1-5
70mm	85mm 85.093-85.071mm	35mm	HM-85-35-70.00	Please see our web catalog for pricing.
		67mm	HM-85-67-70.00	
		78mm	HM-85-78-70.00	
78mm	95mm 95.093-95.071mm	40mm	HM-95-40-78.00	
		78mm	HM-95-78-78.00	
		105mm	HM-95-105-78.00	
85mm	105mm 105.101-105.079mm	40mm	HM-105-40-85.00	
		78mm	HM-105-78-85.00	
		105mm	HM-105-105-85.00	
95mm	115mm 115.101-115.079mm	45mm	HM-115-45-95.00	
		89mm	HM-115-89-95.00	
		112mm	HM-115-112-95.00	
105mm	125mm 125.117-125.092mm	45mm	HM-125-45-105.00	
		89mm	HM-125-89-105.00	
		112mm	HM-125-112-105.00	

Note: Metric head-liner bushings are the same as metric head-press-fit bushings.

### QUANTITY DISCOUNTS

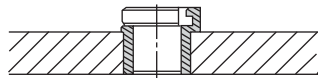
Quantity	1	6	12	24	50	100	200	500
	-5	-11	-23	-49	-99	-199	-499	Up
Discount %	Net	18%	29%	34%	42%	48%	50%	52%
Multiplier	1.00	.82	.71	.66	.58	.52	.50	.48

USA				METRIC			
BODY OD	E	F DIA	G	BODY OD	E	F DIA	G
5/16	1/4	.365	3/32	12mm	9.5mm	15mm	3mm
1/2	3/8	9/16	3/32	15mm	11mm	18mm	3mm
3/4	1/2	13/16	3/32	18mm	13mm	22mm	4mm
1	21/32	1-1/16	1/8	22mm	15.5mm	26mm	4mm
1-3/8	7/8	1-7/16	1/8	26mm	17.5mm	30mm	4mm

### APPLICATIONS:

Similar to an HL head liner, but incorporating a special locking tab that eliminates the need for a lockscrew. Un-A-Lok<sup>®</sup> liners are permanent bushings used to hold SF renewable drill bushings (on the "slip" side only, not the "fixed" side). Although slightly more expensive than a head liner plus a lockscrew, installation time is dramatically reduced. Patent no. 3,015,242 and 3,099,079.



### ORDERING EXAMPLES:

UL-20-5 Standard USA liner bushing  
UL-20-5U Unground OD  
ULM-12-10 Standard metric liner bushing

### STANDARD LINER ID TOLERANCES:

3/16 to 5/16"	+.0001/+0.0004	8 to 10mm	+.005/+0.014mm
1/2"	+.0002/+0.0005	12 to 18mm	+.006/+0.017mm
3/4"	+.0003/+0.0006		(G6 tolerance)
1"	+.0004/+0.0007		

### USA

ID	OD	LENGTH	PART NO.	PRICE 1-5
3/16	5/16 .3141-.3138 (.327-.322 UNG)	5/16	UL-20-5	Please see our web catalog for pricing.
		3/8	UL-20-6	
		1/2	UL-20-8	
		3/4	UL-20-12	
5/16	1/2 .5017-.5014 (.520-.515 UNG)	3/8	UL-32-6	
		1/2	UL-32-8	
		3/4	UL-32-12	
1/2	3/4 .7518-.7515 (.770-.765 UNG)	1/2	UL-48-8	
		3/4	UL-48-12	
		1	UL-48-16	
3/4	1 1.0018-1.0015 (1.020-1.015 UNG)	1/2	UL-64-8	
		3/4	UL-64-12	
		1	UL-64-16	
1	1-3/8 1.3772-1.3768 (1.395-1.390 UNG)	1/2	UL-88-8	
		3/4	UL-88-12	
		1	UL-88-16	
		1-3/8	UL-88-22	

### METRIC

ID (G6)	OD (s6)	LENGTH	PART NO.	PRICE 1-5
8mm	12mm 12.039-12.028mm	10mm	ULM-12-10-8.00	Contact Factory
		16mm	ULM-12-16-8.00	
10mm	15mm 15.039-15.028mm	12mm	ULM-15-12-10.00	Contact Factory
		20mm	ULM-15-20-10.00	
		25mm	ULM-15-25-10.00	
12mm	18mm 18.039-18.028mm	12mm	ULM-18-12-12.00	Contact Factory
		20mm	ULM-18-20-12.00	
		25mm	ULM-18-25-12.00	
15mm	22mm 22.048-22.035mm	16mm	ULM-22-16-15.00	Contact Factory
		28mm	ULM-22-28-15.00	
		36mm	ULM-22-36-15.00	
18mm	26mm 26.048-26.035mm	16mm	ULM-26-16-18.00	Contact Factory
		28mm	ULM-26-28-18.00	
		36mm	ULM-26-36-18.00	

### QUANTITY DISCOUNTS

Quantity	1	6	12	24	50	100	200	500
	-5	-11	-23	-49	-99	-199	-499	Up
Discount %	Net	18%	29%	34%	42%	48%	50%	52%
Multiplier	1.00	.82	.71	.66	.58	.52	.50	.48