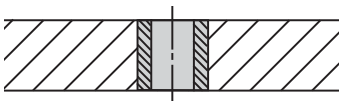
BUSHING SELECTION

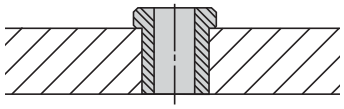
USA				METRIC			
P	20	8	.1250	PM	8	12	4.50
Type	OD in 64ths of an inch	Length in 16ths of an inch	ID as 4-place decimal inch	Type	OD in mm	Length in mm	ID as 2-place decimal mm

PRESS FIT:

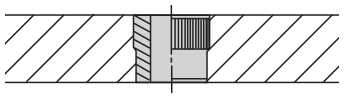
Types **P, PC** (carbide), and **PM** (metric). This is the most-popular and least-expensive drill bushing. P bushings are permanently pressed into the jig plate, usually flush with the top surface. They are generally used for single-step drilling or reaming operations when you do not expect to replace bushings during the tooling's lifetime. P bushings can be mounted closer together than headed bushings, but offer less resistance to heavy axial loads.

HEAD PRESS FIT:

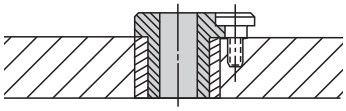
Types **H**, **HC** (carbide), and **HM** (metric). Similar to a P bushing, but with a head to resist heavy axial loads. H bushings are permanently pressed into the jig plate. They are generally used for single-step drilling or reaming operations when you do not expect to replace bushings during the tooling's lifetime. The head can be left exposed, or recessed by counterboring the installation hole. Note: The "length" listed for a USA head-press-fit bushing refers to its length under the head, while the metric version's "length" is its overall length.

SERRATED PRESS FIT:

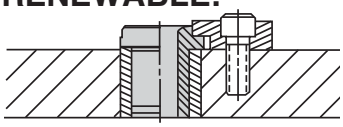
Types **SP** and **SPM** (metric). Similar to a P bushing, but with top serrations to prevent rotation in soft materials. Recommended in high-torque situations for materials such as magnesium, aluminum, masonite, or wood. Finish-ground OD ensures accurate ID location. Serrations also resist axial force to prevent pushing the bushing through the jig plate.

SLIP/FIXED RENEWABLE:

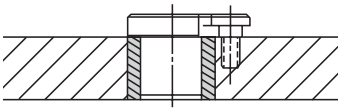
Types **SF, SFC** (carbide), and **SFM** (metric). Replaceable bushing generally used with a liner bushing and lockscrew. Use when you expect to replace bushings during the tooling's lifetime, or when you want to switch bushings to perform multi-step operations with the same tooling. SF bushings combine the benefits of older S-type slip-renewable and F-type fixed-renewable bushings: One side has a small recess for fixed mounting; the other has a locking recess that allows the bushing to slip down, then lock in place by rotating it. S and F types are now obsolete and combination SF bushings will be furnished at no extra charge.

FLAT MILLED RENEWABLE:

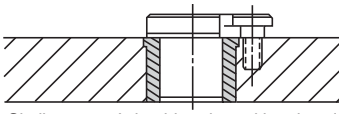
Types **FM** and **FMC** (carbide). Replaceable bushing used for extra resistance to rotational forces under harsh conditions. This bushing, generally used with a liner, has a milled locking flat to allow fastening securely with a flat clamp. FM bushings also have a standard recess on the other side to allow using a lockscrew instead.

LINER:

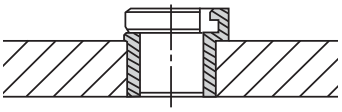
Types **L** and **PM** (metric). Liners are permanent bushings used to hold renewable drill bushings. The liner's ID has a precise sliding fit with the renewable bushing's OD. The hardened liner accurately locates the renewable bushing and protects the jig plate from wear caused by frequent bushing replacement.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

HEAD LINER:

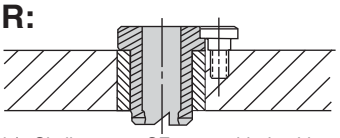
Types **HL** and **HM** (metric). Similar to an L bushing, but with a head to resist heavy axial loads. Head liners are permanent bushings used to hold renewable drill bushings. The head liner's ID has a precise sliding fit with the renewable bushing's OD. The hardened head liner accurately locates the 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.

UN-A-LOK® LINER:

Types **UL** and **ULM** (metric). Similar to an HL head liner, but incorporating a special locking tab that eliminates the need for a lockscrew. Un-A-Lok® 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 lock screw, installation time is dramatically reduced.

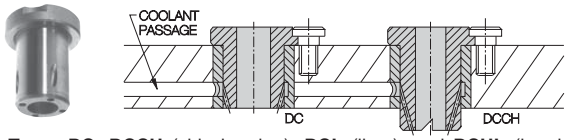
CHIP BREAKER:

Types **CH** and **CHM** (metric). Similar to an SF renewable bushing, but with specially designed chip-breaking notches on the drill-exit end. Use to break up chips from tough, stringy materials, to reduce friction and heat buildup. Reduces bushing wear at the drill-exit end and reduces the chance of tool or workpiece damage. A chip-breaker bushing should extend beyond its liner to allow chips to escape. Chip breakers are also available on other bushing types such as P, H, and DC.

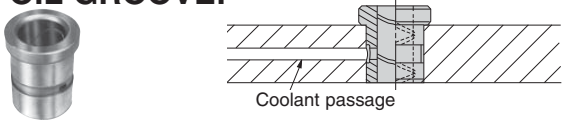
BUSHING SELECTION

DIRECTED COOLANT:



Types **DC, DCCH** (chip breaker), **DCL** (liner), and **DCHL** (head liner). Similar to an SF renewable bushing, but with passages to direct coolant to the cutting area. This design is particularly good for washing away chips, especially when ordered as the combination Directed Coolant Chip Breaker (DCCH). DC bushings require special liners, DCL or DCHL, to direct coolant from a drilled manifold passage to the holes in the bushing's OD wall.

OIL GROOVE:

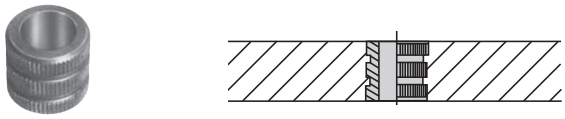


Oil grooves are available on most drill-bushing types, including P, H, and SF. Use when you need complete drill lubrication and cooling, such as when drilling hardened steel. Oil grooves are specially designed coolant passageways in the bushing's ID wall. Choose from 25 different groove styles. End wipers are also available, to keep out dirt and chips.

DIAMOND GROOVE:

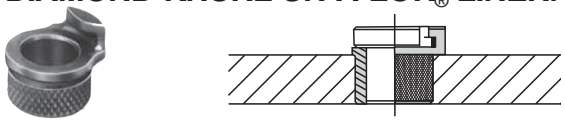
Types **DG** and **DGM** (metric). A bushing for cast-in-place or potted installation. Diamond-knurled OD provides superior holding strength against both rotational and axial forces. Since the bushing's OD is not ground, keep the ID accurately located during casting or potting to ensure accuracy in the finished tool.

SERRATA GROOVE:



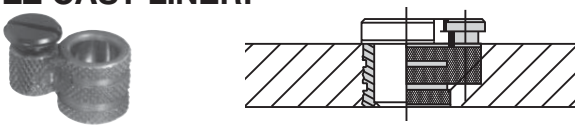
Type **SG.** Can be cast in place or potted, just as a diamond-groove bushing, or can also be pressed into an installation hole. Straight knurl provides less resistance to axial loads than the diamond knurl on a DG bushing. Since the bushing's OD is not ground, keep the ID accurately located during casting or potting to ensure accuracy in the finished tool.

DIAMOND-KNURL UN-A-LOK® LINER:



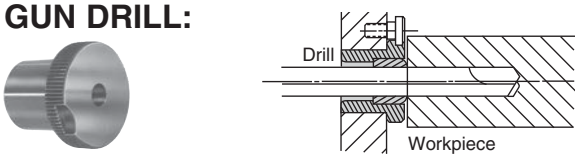
Types **ULD** and **ULDM** (metric). A liner for cast-in-place or potted installation, used to hold SF renewable drill bushings. Un-A-Lok® liners incorporate a special locking tab that eliminates the need for a lockscrew. Holds only the "slip" side of an SF bushing, not the "fixed" side. Diamond-knurled OD provides superior holding strength against both rotational and axial forces. Since the bushing's OD is not ground, keep the ID accurately located during casting or potting to ensure accuracy in the finished tool.

EZ CAST LINER:



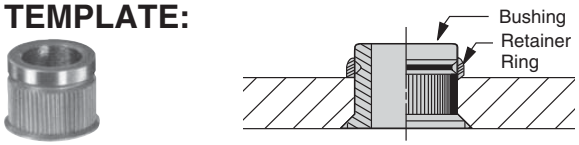
Type **EZ**. Another liner for cast-in-place or potted installation, used to hold SF renewable drill bushings. Unlike diamond-knurl unilock liners, EZ-cast liners hold either the "slip" or "fixed" side of an SF bushing, since they include an integral lockscrew holder. Diamond-knurled OD provides superior holding strength against both rotational and axial forces. Since the bushing's OD is not ground, keep the ID accurately located during casting or potting to ensure accuracy in the finished tool.

GUN DRILL:



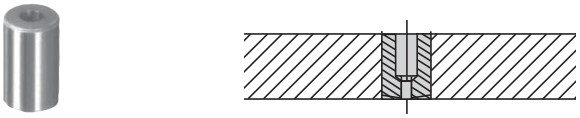
Types **GD, GDL** (liner), and **GDI** (insert). Drill bushings for gun-drilling machines, such as Eldorado, Drillmation, DeHoff, and Lahr. Gun drill bushings are similar to SF renewable bushings, but with the drill bearing at the bushing's head end. Depending on the gun-drilling machine, bushings are either one-piece or two-piece (a liner and an insert).

TEMPLATE:



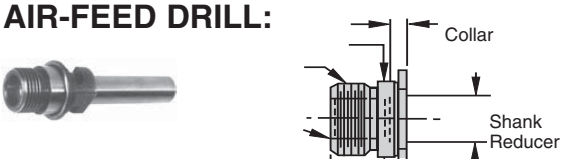
Type **TB.** An economical bushing designed for thin template jig plates from 1/16- to 3/8-inch thick. Bushings are held in place by a retainer ring. The OD serrations prevent the bushing from spinning. Bushings can be removed and reused by breaking the aluminum retainer ring (extra retainer rings available).

CIRCUIT BOARD:



Types **CB** and **CBC** (carbide). Headless and head-type bushings made especially for circuit-board drilling machines. Available for Electro-Mechano, Excellon, Waco, Digital, Nationwide, Edlund, Tektronix, Leland-Gifford, Palomar, Hughes, Rapidrill, and Reliable drilling machines.

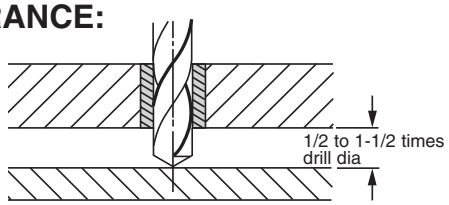
AIR-FEED DRILL:



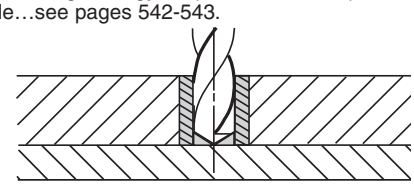
Type **A**. Drill-bushing shanks, collars, adaptors, and locking accessories for air-feed drills, tappers, and back-spotfacers. Available for all standard drill motors, including Gardner-Denver, Keller, Aro, Buckeye, Quackenbush, Desoutter, and Ingersoll-Rand.

INSTALLATION AND TECHNICAL DATA

RECOMMENDED CHIP CLEARANCE:

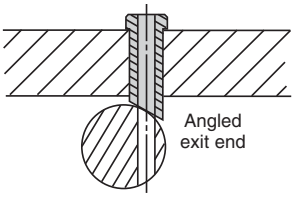


To minimize drill bending and maximize hole accuracy, mount drill bushings as close to the workpiece as possible while still allowing adequate chip clearance. The necessary clearance depends on workpiece material and chip stringiness. For example, cast iron, with fine chips requires about 1/2 times drill 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.

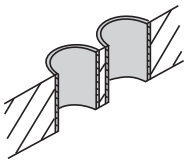
SLOPED WORKPIECE SURFACES:

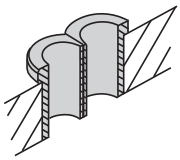


Whenever the drilling axis is not perpendicular to the workpiece surface, locate the exit end as close to the part as possible. Otherwise the drill will tend to wander. For maximum drill guiding, we recommend specifying bushings with an angle milled on the exit end, tangent to the workpiece surface at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

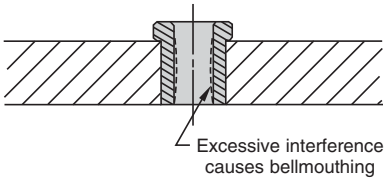
SPECIAL BUSHINGS FOR CLOSE HOLE SPACING:

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:



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.

USA

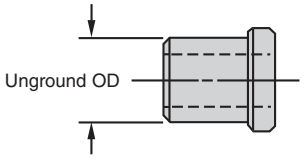
PRESS-FIT BUSHING OD		RECOMMENDED HOLE SIZE
NOM.	ACTUAL	
5/32	.1578-.1575	.1565-.1570
3/16	.1891-.1888	.1880-.1883
13/64	.2046-.2043	.2037-.2040
1/4	.2516-.2513	.2507-.2510
5/16	.3141-.3138	.3132-.3135
3/8	.3766-.3763	.3757-.3760
13/32	.4078-.4075	.4069-.4072
7/16	.4392-.4389	.4382-.4385
1/2	.5017-.5014	.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

METRIC

PRESS-FIT BUSHING OD		RECOMMENDED HOLE SIZE
NOM.	ACTUAL (s6)	(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

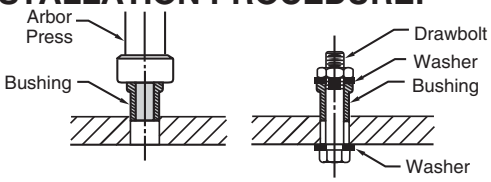
INSTALLATION AND TECHNICAL DATA

UNGROUND BUSHINGS AVAILABLE FOR OVERSIZE HOLES:



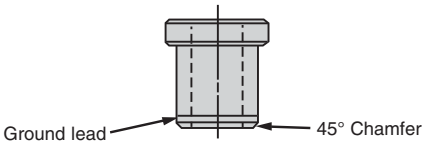
We offer bushings with unfinished ODs for custom-fitting to oversize holes. They are slightly larger than nominal diameter to provide grinding stock, .005-.020 extra, depending on the OD size (see charts under each specific bushing type). We recommend grinding on a mandrel to hold ID/OD concentricity.

INSTALLATION PROCEDURE:



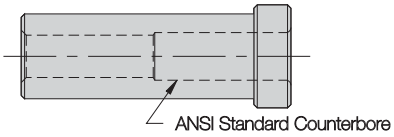
We recommend installing bushings with an arbor press whenever possible. If the bushing's OD is large enough, you can also use a drawbolt with two washers as shown above. If a hammer is the only tool available, do not strike the bushing directly or it could fracture. Use a soft-metal punch to cushion the blows. Before installing a press-fit bushing, lubricate the inside of the mounting hole and outside of the bushing with a lubricant such as lithium grease. Otherwise the bushing may score the mounting hole, and may be difficult to replace later.

GROUND LEAD FOR EASY INSTALLATION:



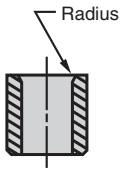
All bushings feature a concentric ground lead and a 45° chamfer on the exit end to ensure perfect alignment during installation.

COUNTERBORES ON LONG BUSHINGS:



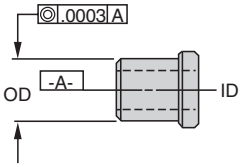
Long bushings with small IDs are slightly counterbored for proper drill-bearing length and chip clearance, as specified by ANSI standards. Counterbores prevent binding and heat buildup due to excessive bearing length. See chart on page 514 for ANSI counterbore depths. Counterbore diameters are generally 1/32 inch larger than the inside diameter, and are angled at the bottom for smooth entrance. No-counterbore bushings are available on request as specials.

DRILL ENTRANCE RADIUS:



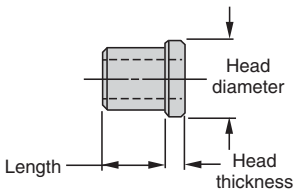
Bushings feature a blended and polished radius at the drill-entrance end for smooth drill entry and proper alignment, preventing drill wear and breakage. Radius size varies in proportion to drill size.

CONCENTRICITY:



Bushing OD is ground concentric to the ID to within .0003 TIR for ID sizes from 1/8 inch to 1/2 inch (3mm to 12mm), unless otherwise indicated. For larger or smaller sizes, concentricity is within .0005 TIR. Unground bushings are concentric to within .006 TIR. On counterbored bushings, concentricity applies only over the drill-bearing length.

OTHER TOLERANCES:



Any dimensions where tolerances are not specifically listed are held to +/- .010 inches on standard ANSI sizes, and +/-.015 inches on larger sizes (extended range). Special tolerances for any dimension are available on request as specials.

MATERIAL:

Standard drill-bushing material is durable 1144 Stressproof steel, heat treated to achieve RC 62-64 ID hardness, and other high-carbon steels. Optional materials such as tungsten carbide (Grade C2 carbide with steel head), 52100 steel, A2 tool steel, D2 tool steel, M2 tool steel, 416 stainless, 440C stainless, 17-4PH stainless, 303 stainless, 660 bronze, Ampco 18 bronze, Ampco 21 bronze, Oilite, and brass are available as specials. See pages 518, 523, and 530 for carbide bushings.

COUNTERBORE DATA

TYPE P — DRILL BEARING LENGTH

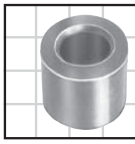
DRILL SIZE (ID)	OD	BUSHING LENGTH											
		1/4	5/16	3/8	1/2	3/4	1	1-3/8	1-1/2	1-3/4	2-1/8	2-1/2	3
.0135 - .0291	5/32	FULL	FULL	FULL	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
.0292 - .0519													
.0520 - .0625													
.0135 - .0291	3/16	FULL	FULL	FULL	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
.0292 - .0519													
.0520 - .0634													
.0635 - .0995					FULL	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16
.0135 - .0291	13/64	FULL	FULL	FULL	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
.0292 - .0519													
.0520 - .0634													
.0635 - .0995					FULL	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16
.0980 - .1406	1/4	FULL	FULL	FULL	FULL	7/16	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1250 - .1935	5/16	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1935 - .2880	3/8	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1875 - .2570	13/32	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.2340 - .2900	7/16	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1875 - .3160	1/2	FULL	FULL	FULL	FULL	FULL	5/8	3/4	3/4	3/4	3/4	3/4	3/4
.3125 - .4375	5/8	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	1-1/2	1-1/2
.3125 - .5313	3/4	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	1-1/2	1-1/2

TYPE H — DRILL BEARING LENGTH

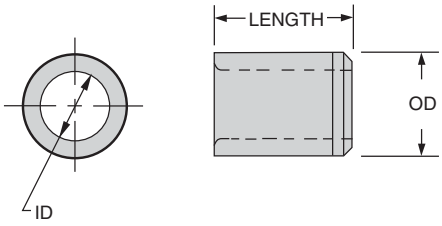
RANGE (ID)	OD	BUSHING LENGTH (UNDER HEAD)											
		1/4	5/16	3/8	1/2	3/4	1	1-3/8	1-1/2	1-3/4	2-1/8	2-1/2	3
.0135 - .0291	5/32	FULL	FULL	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
.0292 - .0519				FULL									
.0520 - .0625													
.0135 - .0291	13/64	FULL	FULL	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
.0292 - .0519													
.0520 - .0634				FULL									
.0635 - .0995					7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16
.0980 - .1406	1/4	FULL	FULL	FULL	7/16	7/16	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1250 - .1935	5/16	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1935 - .2280	3/8	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1875 - .2570	13/32	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.2340 - .2900	7/16	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1875 - .3160	1/2	FULL	FULL	FULL	FULL	FULL	3/4	3/4	3/4	3/4	3/4	3/4	3/4
.3125 - .4375	5/8	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	1-1/2	1-1/2
.3125 - .5313	3/4	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	1-1/2	1-1/2

TYPES SF & FM — DRILL BEARING LENGTH

DRILL SIZE (ID)	OD	BUSHING LENGTH (UNDER HEAD)											
		1/4	5/16	3/8	1/2	5/8	3/4	1	1-3/8	1-1/2	1-3/4	2-1/8	2-1/2	3
.0135 - .0291	3/16	1/4	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
.0292 - .0519		FULL												
.0520 - .0634														
.0635 - .0980				3/8	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16
.0995 - .1405	1/4	FULL	FULL	3/8	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16
.0135 - .0291	5/16	1/4	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
.0292 - .0519		FULL												
.0520 - .0634														
.0635 - .0934			FULL	3/8	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16
.0935 - .1249				FULL										
.1250 - .1935				FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1935 - .2280	3/8	FULL	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.2340 - .2900	7/16	FULL	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1405 - .1889	1/2	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1890 - .3438							FULL	7/8	1	1	1	1	1	1
.2950 - .5625	3/4	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	1-1/2	1-1/2

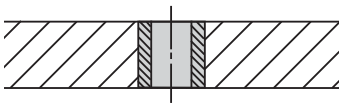


PRESS FIT P



APPLICATIONS:

This is the most-popular and least-expensive drill bushing. P bushings are permanently pressed into the jig plate, usually flush with the top surface. They are generally used for single-step drilling or reaming operations when you do not expect to replace bushings during the tooling's lifetime. P bushings can be mounted closer together than headed bushings, but offer less resistance to heavy axial loads.



ORDERING EXAMPLES:

P-20-16-.1250	Standard USA bushing, inch ID
P-20-16-.1772	Standard USA bushing, mm ID (.1772 = 4.50mm)
P-20-16U-.1250	Unground OD
P-20-16-.1250 REAMER	Reamer tolerance on ID
P-20-16-.1250 NCB	No counterbore on long bushings marked with * (no counterbore is standard on all other bushings)
PC-20-16-.1250	Carbide bushing
PM-8-12-4.50	Standard metric bushing

Standard prices apply only to bushings with a standard-drill-size ID with the stated ID range. See catalog back cover for standard drill sizes and their decimal equivalents. For prices on non-standard ID sizes, including reamer-tolerance and tap-guide bushings, please contact factory.

STANDARD ID TOLERANCES:

From #80 to 1/4"	+ .0001/+.0004	From .35 to 3mm	+.002/+.008mm
		Over 3 to 6mm	+.004/+.012mm
Over 1/4 to 3/4"	+ .0001/+.0005	Over 6 to 10mm	+.005/+.014mm
		Over 10 to 18mm	+.006/+.017mm
Over 3/4 to 1-1/2"	+ .0002/+.0006	Over 18 to 30mm	+.007/+.020mm
		Over 30 to 50mm	+.009/+.025mm
Over 1-1/2 to 2-3/4"	+ .0003/+.0007	Over 50 to 80mm	+.010/+.029mm
		Over 80 to 120mm	+.012/+.034mm
		(G6 tolerance)	

REAMER ID TOLERANCES:

From #60 to 1/4"	+.0005/+.0008	From 1 to 3mm	+.006/+.012mm
		Over 3 to 6mm	+.010/+.018mm
Over 1/4 to 1"	+.0006/+.0010	Over 6 to 10mm	+.013/+.022mm
		Over 10 to 18mm	+.016/+.027mm
Over 1" to 1-1/2"	+.0008/+.0012	Over 18 to 30mm	+.020/+.033mm
		(F6 tolerance)	

ID RANGE	OD	LENGTH	ANSI PART NO.	PRICE 1-5
.0135-.0291 #80-#70 .35-.70mm	5/32 .1578-.1575 (.166-.161 UNG)	1/4	P-10-4	Please see our web catalog for pricing.
		5/16	P-10-5	
		3/8	P-10-6	
		*1/2	P-10-8	
.0292-.0519 #69-3/64 .75-1.25mm		1/4	P-10-4	
		5/16	P-10-5	
		3/8	P-10-6	
		*1/2	P-10-8	
		*3/4	P-10-12	
.0520-.0625 #55-1/16 1.30-1.60mm		1/4	P-10-4	
		5/16	P-10-5	
		3/8	P-10-6	
		*1/2	P-10-8	
		*3/4	P-10-12	
.0520-.0634 #55-1/16 1.30-1.60mm	3/16 .1891-.1888 (.201-.197 UNG)	1/4	P-12-4	
		5/16	P-12-5	
		3/8	P-12-6	
		*1/2	P-12-8	
		*5/8	P-12-10	
		*3/4	P-12-12	
.0635-.0995 #52-#39 1.65-2.50mm		1/4	P-12-4	
		5/16	P-12-5	
		3/8	P-12-6	
		1/2	P-12-8	
		5/8	P-12-10	
		*3/4	P-12-12	
.0135-.0291 #80-#70 .35-.70mm	13/64 .2046-.2043 (.213-.208 UNG)	1/4	P-13-4	
		5/16	P-13-5	
		3/8	P-13-6	
		*1/2	P-13-8	
.0292-.0519 #69-3/64 .75-1.30mm		1/4	P-13-4	
		5/16	P-13-5	
		3/8	P-13-6	
		*1/2	P-13-8	
		*3/4	P-13-12	
.0520-.0634 #55-1/16 1.35mm-1.60mm		1/4	P-13-4	
		5/16	P-13-5	
		3/8	P-13-6	
		*1/2	P-13-8	
		*3/4	P-13-12	
		*1	P-13-16	
.0635-.0995 #52-#39 1.65-2.50mm		1/4	P-13-4	
		5/16	P-13-5	
		3/8	P-13-6	
		1/2	P-13-8	
		*3/4	P-13-12	
		*1	P-13-16	
		*1-3/8	P-13-22	

* Counterbored, leaving correct drill-bearing length and clearance (see page 514 for bearing length).

QUANTITY DISCOUNTS

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

P PRESS FIT

ID RANGE	OD	LENGTH	ANSI PART NO.	PRICE 1-5
.0980-.1406 #40-9/64 2.50-3.50mm	1/4 .2516-.2513 (.265-.260 UNG)	1/4	P-16-4	Please see our web catalog for pricing.
		5/16	P-16-5	
		3/8	P-16-6	
		1/2	P-16-8	
		5/8	P-16-10	
		*3/4	P-16-12	
		*1	P-16-16	
		*1-3/8	P-16-22	
		*1-1/2	P-16-24	
		*1-3/4	P-16-28	
.1250-.1935 1/8-#10 3.20-4.90mm	5/16 .3141-.3138 (.327-.322 UNG)	1/4	P-20-4	
		5/16	P-20-5	
		3/8	P-20-6	
		1/2	P-20-8	
		5/8	P-20-10	
		3/4	P-20-12	
		*1	P-20-16	
		*1-3/8	P-20-22	
		*1-1/2	P-20-24	
		*1-3/4	P-20-28	
.1935-.2280 #10-#1 4.90-5.80mm	3/8 .3766-.3763 (.390-.385 UNG)	1/4	P-24-4	
		5/16	P-24-5	
		3/8	P-24-6	
		1/2	P-24-8	
		5/8	P-24-10	
		3/4	P-24-12	
		*1	P-24-16	
.1875-.2570 3/16-F 4.75-6.50mm	13/32 .4078-.4075 (.421-.416 UNG)	1/4	P-26-4	
		5/16	P-26-5	
		3/8	P-26-6	
		1/2	P-26-8	
		3/4	P-26-12	
		*1	P-26-16	
		*1-3/8	P-26-22	
		*1-1/2	P-26-24	
		*1-3/4	P-26-28	
.2340-.2900 A-L 5.90-7.40mm	7/16 .4392-.4389 (.453-.448 UNG)	1/4	P-28-4	
		5/16	P-28-5	
		3/8	P-28-6	
		1/2	P-28-8	
		5/8	P-28-10	
		3/4	P-28-12	
		*1	P-28-16	
.1875-.3160 3/16-O 4.75-8.00mm	1/2 .5017-.5014 (.520-.515 UNG)	1/4	P-32-4	
		5/16	P-32-5	
		3/8	P-32-6	
		1/2	P-32-8	
		3/4	P-32-12	
		*1	P-32-16	
		*1-3/8	P-32-22	
		*1-1/2	P-32-24	
		*1-3/4	P-32-28	
		*2-1/8	P-32-34	

ID RANGE	OD	LENGTH	ANSI PART NO.	PRICE 1-5
.2950-.3438 M-11/32 7.50-8.75mm	9/16 .5642-.5639 (.582-.577 UNG)	1/4	P-36-4	Please see our web catalog for pricing.
		5/16	P-36-5	
		3/8	P-36-6	
		1/2	P-36-8	
		5/8	P-36-10	
		3/4	P-36-12	
		1	P-36-16	
.3125-.4375 5/16-7/16 7.90-11.00mm	5/8 .6267-.6264 (.645-.640 UNG)	1/4	P-40-4	
		5/16	P-40-5	
		3/8	P-40-6	
		1/2	P-40-8	
		5/8	P-40-10	
		3/4	P-40-12	
		1	P-40-16	
		1-1/4	P-40-20	
		1-3/8	P-40-22	
		1-1/2	P-40-24	
		1-3/4	P-40-28	
		2-1/8	P-40-34	
.3125-.5312 5/16-17/32 7.90-13.50mm	3/4 .7518-.7515 (.770-.765 UNG)	1/4	P-48-4	
		5/16	P-48-5	
		3/8	P-48-6	
		1/2	P-48-8	
		5/8	P-48-10	
		3/4	P-48-12	
		1	P-48-16	
		1-1/4	P-48-20	
		1-3/8	P-48-22	
		1-1/2	P-48-24	
		1-3/4	P-48-28	
		2-1/8	P-48-34	
		*2-1/2	P-48-40	
.5000-.6562 1/2-21/32 12.50-16.50mm	7/8 .8768-.8765 (.895-.890 UNG)	5/16	P-56-5	
		3/8	P-56-6	
		1/2	P-56-8	
		5/8	P-56-10	
		3/4	P-56-12	
		1	P-56-16	
		1-1/4	P-56-20	
		1-3/8	P-56-22	
		1-1/2	P-56-24	
		1-3/4	P-56-28	
		2-1/8	P-56-34	
		2-1/2	P-56-40	

* Counterbored, leaving correct drill-bearing length and clearance (see page 514 for bearing length).

QUANTITY DISCOUNTS

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

PRESS FIT P

ID RANGE	OD	LENGTH	ANSI PART NO.	PRICE 1-5
.5000-.7656 1/2-49/64 12.50-19.50mm	**1** 1.0018-1.0015 (1.020-1.015 UNG)	1/2	P-64-8	Please see our web catalog for pricing.
		5/8	P-64-10	
		3/4	P-64-12	
		1	P-64-16	
		1-1/4	P-64-20	
		1-3/8	P-64-22	
		1-1/2	P-64-24	
		1-3/4	P-64-28	
		2-1/8	P-64-34	
		2-1/2	P-64-40	
		3	P-64-48	
.7656-.8438 49/64-27/32 19.50-21.50mm	**1-1/8** 1.1270-1.1267 (1.145-1.140 UNG)	1/2	P-72-8	
		5/8	P-72-10	
		3/4	P-72-12	
		1	P-72-16	
		1-1/4	P-72-20	
		1-1/2	P-72-24	
		1-3/4	P-72-28	
.8594-.9375 55/64-15/16 22.00-24.00mm	**1-1/4** 1.2520-1.2517 (1.270-1.265 UNG)	5/8	P-80-10	
		3/4	P-80-12	
		1	P-80-16	
		1-1/4	P-80-20	
		1-1/2	P-80-24	
		1-3/4	P-80-28	
		2	P-80-32	
.6250-1.0312 5/8-1-1/32 16.00-26.00mm	**1-3/8** 1.3772-1.3768 (1.395-1.390 UNG)	1/2	P-88-8	
		5/8	P-88-10	
		3/4	P-88-12	
		1	P-88-16	
		1-1/4	P-88-20	
		1-3/8	P-88-22	
		1-1/2	P-88-24	
		1-3/4	P-88-28	
		2	P-88-32	
		2-1/8	P-88-34	
		2-1/2	P-88-40	
		3	P-88-48	
1.0156-1.1250 1-1/64-1-1/8 26.00-29.00mm	**1-1/2** 1.5021-1.5018 (1.520-1.515 UNG)	3/4	P-96-12	
		1	P-96-16	
		1-1/4	P-96-20	
		1-1/2	P-96-24	
		1-3/4	P-96-28	
		2	P-96-32	
		2-1/4	P-96-36	

ID RANGE	OD	LENGTH	ANSI PART NO.	PRICE 1-5
1.0000-1.3906 1-1-25/64 25.00-35.00mm	**1-3/4** 1.7523-1.7519 (1.770-1.765 UNG)	3/4	P-112-12	Please see our web catalog for pricing.
		1	P-112-16	
		1-3/8	P-112-22	
		1-1/2	P-112-24	
		1-3/4	P-112-28	
		2-1/8	P-112-34	
		2-1/2	P-112-40	
		3	P-112-48	
1.3750-1.7656 1-3/8-1-49/64 35.00-45.00mm	**2-1/4** 2.2525-2.2521 (2.270-2.265 UNG)	1	P-144-16	
		1-3/8	P-144-22	
		1-1/2	P-144-24	
		1-3/4	P-144-28	
		2-1/8	P-144-34	
		2-1/2	P-144-40	
		3	P-144-48	

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

QUANTITY DISCOUNTS

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

Hyquip Limited New Brunswick Street Horwich Bolton Lancashire BL6 7JB UK
Company Registered in England No: 4167649 VAT Registration No: 732 5692 25 BS EN ISO 9001:2008 No: LRQ 0964389

PC PRESS FIT CARBIDE

ID RANGE	OD	LENGTH	ANSI PART NO.	PRICE 1-5
.0280-.0468 #70-#56 .75-1.15mm	**5/32** .1578-.1575	5/16	PC-10-5	Contact Factory
		1/2	PC-10-8	
.0469-.0625 3/64-1/16 1.20-1.55mm		5/16	PC-10-5	Contact Factory
		1/2	PC-10-8	
.0550-.0995 #54-#39 1.40-2.50mm	**13/64** .2046-.2043	5/16	PC-13-5	Contact Factory
		1/2	PC-13-8	
.0995-.1360 #39-#29 2.55-3.40mm	**1/4** .2516-.2513	5/16	PC-16-5	Contact Factory
		1/2	PC-16-8	
.1285-.1875 #30-3/16 3.30-4.75mm	**5/16** .3141-.3138	5/16	PC-20-5	Contact Factory
		1/2	PC-20-8	
		3/4	PC-20-12	
		1	PC-20-16	
.1875-.2500 3/16-1/4 4.80-6.30mm	**13/32** .4078-.4075	5/16	PC-26-5	Contact Factory
		1/2	PC-26-8	
		3/4	PC-26-12	
		1	PC-26-16	
.2188-.3125 7/32-5/16 5.60-7.90mm	**1/2** .5017-.5014	5/16	PC-32-5	Contact Factory
		1/2	PC-32-8	
		3/4	PC-32-12	
		1	PC-32-16	
		1-3/8	PC-32-22	
.3125-.4219 5/16-27/64 8.00-10.50mm	**5/8** .6267-.6264	1/2	PC-40-8	Contact Factory
		3/4	PC-40-12	
		1	PC-40-16	
		1-3/8	PC-40-22	
.3750-.5000 3/8-1/2 9.60-12.50mm	**3/4** .7518-.7515	1/2	PC-48-8	Contact Factory
		3/4	PC-48-12	
		1	PC-48-16	
		1-3/8	PC-48-22	
.5000-.6250 1/2-5/8 13.00-15.50mm	**7/8** .8768-.8765	1/2	PC-56-8	Contact Factory
		3/4	PC-56-12	
		1	PC-56-16	
		1-3/8	PC-56-22	
		1-3/4	PC-56-28	

ID RANGE	OD	LENGTH	ANSI PART NO.	PRICE 1-5
.5000-.7500 1/2-3/4 13.00-19.00mm	**1** 1.0018-1.0015	1/2	PC-64-8	Contact Factory
		3/4	PC-64-12	
		1	PC-64-16	
		1-3/8	PC-64-22	
		1-3/4	PC-64-28	
.7500-1.0000 3/4-1 19.50-25.00mm	**1-3/8** 1.3772-1.3768	3/4	PC-88-12	Contact Factory
		1	PC-88-16	
		1-3/8	PC-88-22	
		1-3/4	PC-88-28	
		2-1/8	PC-88-34	
		2-1/2	PC-88-40	
1.0000-1.3750 1–1-3/8 26.00-34.00mm	**1-3/4** 1.7523-1.7519	1	PC-112-16	Contact Factory
		1-3/8	PC-112-22	
		1-3/4	PC-112-28	
		2-1/8	PC-112-34	
		2-1/2	PC-112-40	
		3	PC-112-48	
1.3750-1.7500 1-3/8-1-3/4 35.00-44.00mm	**2-1/4** 2.2525-2.2521	1	PC-144-16	Contact Factory
		1-3/8	PC-144-22	
		1-3/4	PC-144-28	
		2-1/8	PC-144-34	
		2-1/2	PC-144-40	
		3	PC-144-48	

PRESS FIT METRIC PM

ID RANGE (G6)	OD (s6)	LENGTH	ANSI PART NO.	PRICE 1-5
.35-1.00mm	4mm 4.027-4.019mm	*6mm	PM-4-6	Please see our web catalog for pricing.
		*9mm	PM-4-9	
1.01-1.80mm		6mm	PM-4-6	
		9mm	PM-4-9	
1.81-2.60mm	5mm 5.027-5.019mm	6mm	PM-5-6	
		9mm	PM-5-9	
2.61-3.30mm	6mm 6.027-6.019mm	8mm	PM-6-8	
		12mm	PM-6-12	
		16mm	PM-6-16	
3.31-4.00mm	7mm 7.032-7.023mm	8mm	PM-7-8	
		12mm	PM-7-12	
		16mm	PM-7-16	
4.01-5.00mm	8mm 8.032-8.023mm	8mm	PM-8-8	
		12mm	PM-8-12	
		16mm	PM-8-16	
5.01-6.00mm	10mm 10.032-10.023mm	10mm	PM-10-10	
		16mm	PM-10-16	
		20mm	PM-10-20	
6.01-8.00mm	12mm 12.039-12.028mm	10mm	PM-12-10	
		16mm	PM-12-16	
		20mm	PM-12-20	
8.01-10.00mm	15mm 15.039-15.028mm	12mm	PM-15-12	
		20mm	PM-15-20	
		25mm	PM-15-25	
10.01-12.00mm	18mm 18.039-18.028mm	12mm	PM-18-12	
		20mm	PM-18-20	
		25mm	PM-18-25	
12.01-15.00mm	22mm 22.048-22.035mm	16mm	PM-22-16	
		28mm	PM-22-28	
		36mm	PM-22-36	
15.01-18.00mm	26mm 26.048-26.035mm	16mm	PM-26-16	
		28mm	PM-26-28	
		36mm	PM-26-36	
18.01-22.00mm	30mm 30.048-30.035mm	20mm	PM-30-20	
		36mm	PM-30-36	
		45mm	PM-30-45	
22.01-26.00mm	35mm 35.059-35.043mm	20mm	PM-35-20	
		36mm	PM-35-36	
		45mm	PM-35-45	
26.01-30.00mm	42mm 42.059-42.043mm	25mm	PM-42-25	
		45mm	PM-42-45	
		56mm	PM-42-56	
30.01-35.00mm	48mm 48.059-48.043mm	25mm	PM-48-25	
		45mm	PM-48-45	
		56mm	PM-48-56	
35.01-42.00mm	55mm 55.072-55.053mm	30mm	PM-55-30	
		56mm	PM-55-56	
		67mm	PM-55-67	
42.01-48.00mm	62mm 62.072-62.053mm	30mm	PM-62-30	
		56mm	PM-62-56	
		67mm	PM-62-67	

ID RANGE (G6)	OD (s6)	LENGTH	ANSI PART NO.	PRICE 1-5
48.01-55.00mm	70mm 70.078-70.059mm	30mm	PM-70-30	Please see our web catalog for pricing.
		56mm	PM-70-56	
		67mm	PM-70-67	
55.01-63.00mm	78mm 78.078-78.059mm	35mm	PM-78-35	
		67mm	PM-78-67	
		78mm	PM-78-78	
63.01-70.00mm	85mm 85.093-85.071mm	35mm	PM-85-35	
		67mm	PM-85-67	
		78mm	PM-85-78	
70.01-78.00mm	95mm 95.093-95.071mm	40mm	PM-95-40	
		78mm	PM-95-78	
		105mm	PM-95-105	
78.01-85.00mm	105mm 105.101-105.079mm	40mm	PM-105-40	
		78mm	PM-105-78	
		105mm	PM-105-105	
85.01-95.00mm	115mm 115.101-115.079mm	45mm	PM-115-45	
		89mm	PM-115-89	
		112mm	PM-115-112	
95.01-105.00mm	125mm 125.117-125.092mm	45mm	PM-125-45	
		89mm	PM-125-89	
		112mm	PM-125-112	

* Small metric drill sizes through .80mm are counterbored 1.00mm diameter, with 3mm drill-bearing length.

QUANTITY DISCOUNTS

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