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MILLING ARBOR BUSHINGS

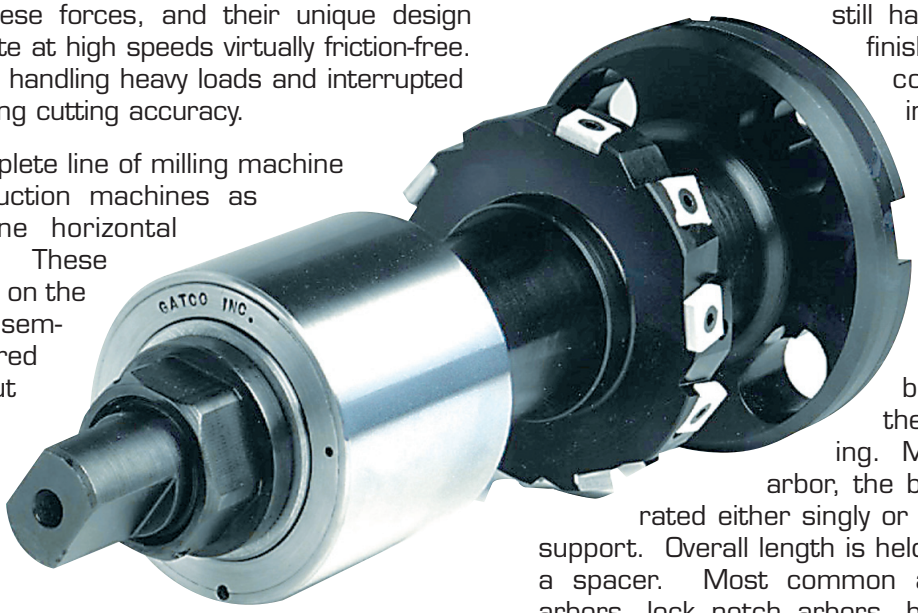
ARBOR BUSHINGS

Description

Milling machine arbor bushing supports receive the most abuse in milling applications, next to the cutters themselves. Quite often, however, milling arbor assemblies are designed and built with little thought given to proper mounting, fit or calibration of the precision bearings, resulting in chatter, vibration and premature failure of the cutters and bushings. Gatco Rotary Milling Arbor Bushings eliminate these problems.

Horizontal milling creates heavy intermittent radial loads on the milling arbor.
Gatco Bushings provide the rigid support necessary to evenly distribute these forces, and their unique design allows them to rotate at high speeds virtually friction-free. They are capable of handling heavy loads and interrupted cuts while maintaining cutting accuracy.

Gatco offers a complete line of milling machine bushings for production machines as well as stand-alone horizontal milling machines. These bushings simply slip on the milling arbor at assembly and are secured when the arbor nut is drawn tight. All fitting and calibration is done by Gatco at the factory.



Commonly milling arbors are designed using single row ball bearings, spherol bearings or bronze bearings. Inherent problems are encountered because there is no effective way to pre-load the bearing, no good means of re-lubricating and usually in-effective seals. These problems will cause chatter, poor tool life and eventually premature failure.

Gatco Anti-Friction Rotary Milling Arbor Bushings are self contained pre-loaded bearing cartridges used to support gang milling arbors. They consist of a stationary outer case; a hardened and ground liner which rotates with the arbor; anti-friction bearings and seals. They are manufactured in several series with each having size and load rating capacities to cover the broadest range of milling applications.

Special Designs

Although a large number of dimensional combinations are available, Gatco Rotary Bushings may be designed and built to meet the requirements of particular applications. Considering the improvements in milling performance and tool life, Gatco Bushings are a practical and economical addition to any milling machine. Gatco's Engineering Department can provide a special design to suit your specific requirements.

Not all Milling Machine Bushings are cataloged due to the numerous variations. Contact GATCO for sizes not listed here.

Application Examples

Three types of milling machine bushings are available:

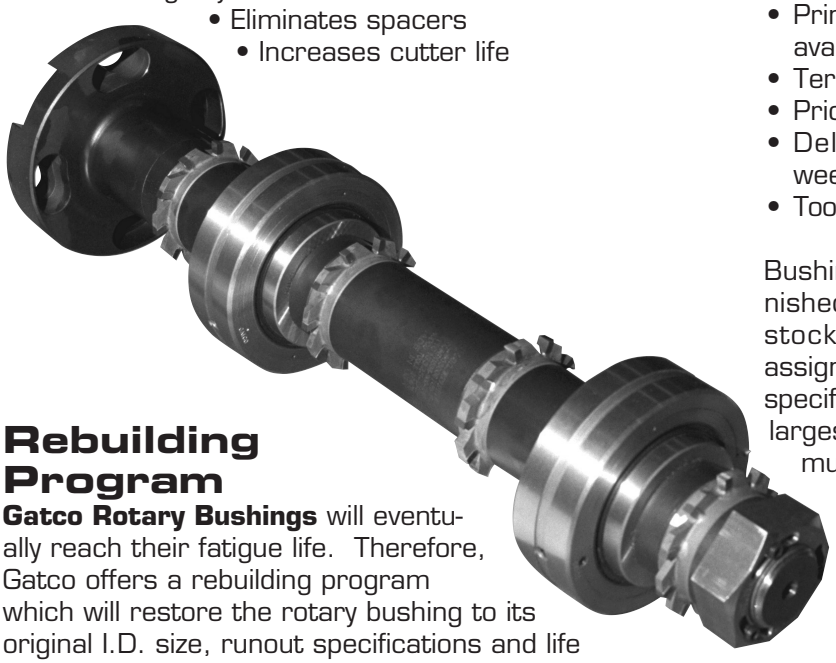
- **Outboard Support Bushings** are mounted on the end of the milling arbor opposite the spindle. This bushing is critical because it has to be capable of handling the high forces generated by the cut and still have the accuracy to hold finish part tolerances. Most common applications include saw arbors, lock notch arbors, bulkhead arbors and half round arbors.

- **Mid-Support Bushings** are mounted on gang arbors and can be positioned anywhere between the spindle and the outboard support bushing. Mounted directly on the arbor, the bushings may be incorporated either singly or in multiples for adequate support. Overall length is held so that they also act as a spacer. Most common applications include saw arbors, lock notch arbors, bulkhead arbors and half round arbors.

- **Tapered O.D. Bushings** are most commonly used to support milling arbors on stand-alone tool room horizontal milling machines. They replace the tapered O.D. bronze bushings commonly designed into these machines.

Features

- Helps dampen and evenly distribute cutting forces
- Eliminates vibration, chatter, twisted arbors, frozen bushings, tool breakage, bearing collar wear and scoring, with substantial savings in milling machine maintenance
- Eliminates excessive mounting clearances
- Sealed to protect bearings from contamination
- Unique cartridge design simplifies replacement
- Incorporates heavy-duty pre-loaded bearings
- Wide selection of I.D., O.D. and length combinations
- Substantially increases maintainable speeds for advantageous use of carbide tools
    - Provides greater precision through increased rigidity of the arbor
    - Eliminates spacers
    - Increases cutter life



Rebuilding Program

Gatco Rotary Bushings will eventually reach their fatigue life. Therefore, Gatco offers a rebuilding program which will restore the rotary bushing to its original I.D. size, runout specifications and life expectancy. Rebuilding can be done an indefinite number of times as long as the case is re-usable as received, and involves replacement of the inner liner, bearings and seals.Upon inspection, if a rotary bushing cannot be rebuilt, it will be returned at a nominal charge for inspection.

Maintenance/Lubrication

Gatco Rotary Bushings require very little maintenance. Only in severe applications or contaminated environments will they require re-greasing. Frequency of re-lubrication must be determined by the end user based on the environment, loads applied and running speed. When re-greasing, it is recommended that the bushing be filled with grease until contaminated grease purges past the seal on both ends. At start up, grease will continue to purge past the seals and will stop when the bearings have purged themselves.

- Recommended grease lubricant is Alvania #2 by Shell Oil (or equivalent).
- Recommended oil lubricant is Mobil DTE (or equivalent).

HOW TO ORDER

- Order by Gatco design number.
- Specify I.D.: Standard I.D. and tolerance will be assigned unless otherwise specified.
- Specify O.D.: O.D. will be provided with approximately .02" grind stock over nominal unless O.D. grind is requested. O.D. will be ground to standard tolerances unless otherwise specified. (Tapered bushings are provided O.D. ground.)
- Special Tolerances: Tolerances other than shown in this catalog are available. Specify your tolerance requirements.
- Special Features: Specify any features required such as flats, etch, keyways, etc.
- Prints: Always provide prints or sketches when available.
- Terms: Net 30 days.
- Prices: Quoted upon request.
- Delivery: Standard lead time is approximately 8 weeks. Consult the factory for current lead times.
- Tool Numbers: Provide end users tool number if available.

Bushings ordered by bushing number only will be furnished with the nominal I.D. and the O.D. with grind stock. Standard manufacturing tolerances will be assigned. No special modifications will be added unless specified. When choosing a bushing always choose the largest bushing which will fit the applications for maximum rigidity.

Standard GATCO Manufacturing Tolerances

Inside Diameter:

Under 41.27	= +0.007mm. +0.015mm.
1.625 and above	= +0.013mm. +0.025mm.

Runout = 0.013mm. T.I.R. (Closer runout avail. on request)

Finish = 0.30-0.50µm.

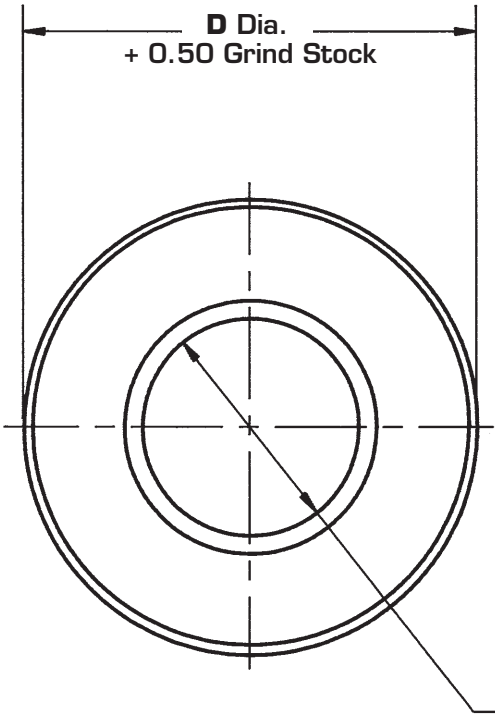
Outside Diameter:

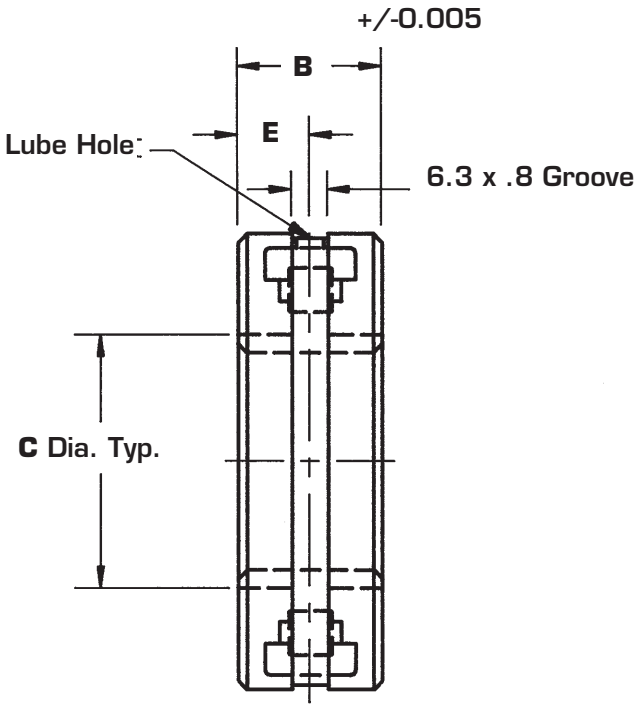
Standard rotary bushings are furnished 0.50mm. oversize for O.D. grinding to fit at assembly by the customer.Finish ground diameter available on request (extra cost). Tapered bushings are provided O.D. ground.

Standard tolerance spread: 0.013mm.

CYLM SERIES

LIGHT DUTY MID OR OUTBOARD SUPPORT BUSHING





See page 1 for tolerances.

Bushings are available with keyways. Corners of keyways must be within "A" diameter.

Capacities are based on 300 R.P.M., 1500 hrs. L10 life.

Refer to inside front cover for modifications or special designs.

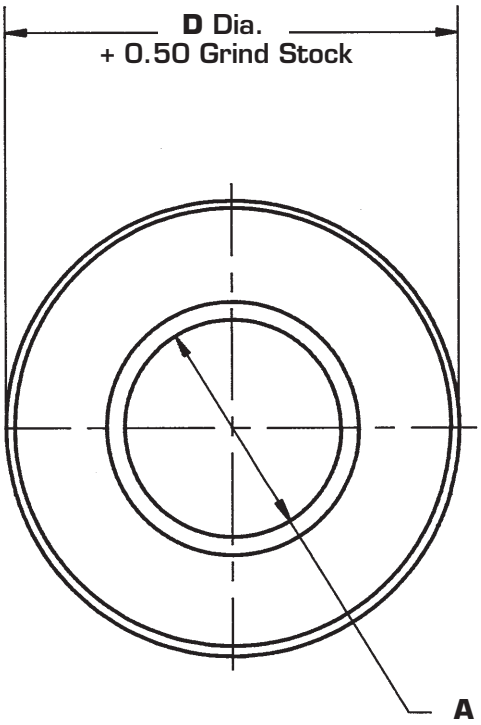
Specify I.D. size required when ordering.

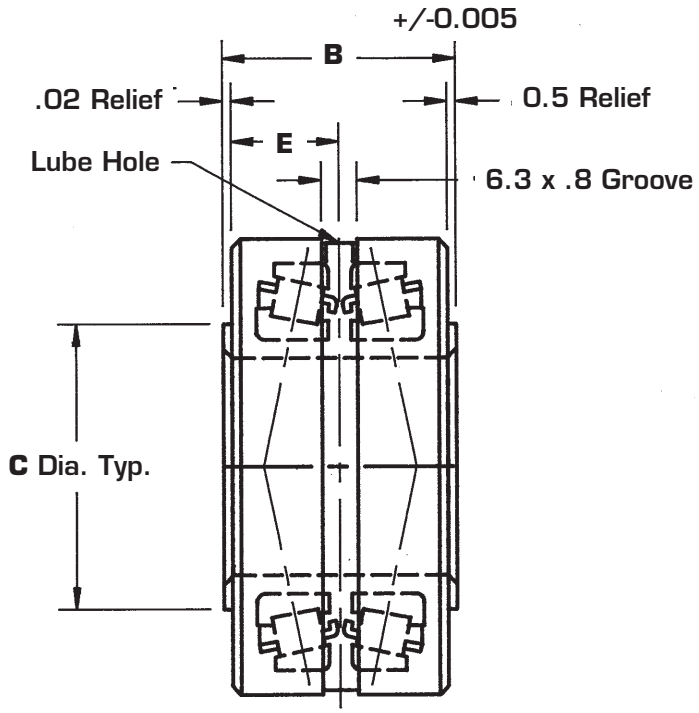
Specify "B" (inner liner length) if other than standard shown in tabulation.

Always choose the largest bushing which will fit the application for maximum rigidity.

CYLM No	A MAX	B MIN	C	D	E	MAX. SPD. R.P.M.	RADIAL N
2206	25.000	25.400	31.5	62.000	12.7	3600	3709
2207	35.000	25.400	40.4	72.000	12.7	2795	5203
2208	38.000	25.400	44.2	80.000	12.7	2664	9225
2209	43.000	25.400	49.8	85.000	12.7	2291	6384
2210	43.000	25.400	49.8	90.000	12.7	2291	6384
2211	55.000	28.000	61.7	100.000	14.0	1878	7758
2212	60.000	28.000	68.8	110.000	14.0	1660	9410
2213	65.000	31.000	68.8	120.000	15.5	1637	11624
2214	70.000	31.000	82.3	125.000	15.5	1397	12085
2215	75.000	31.000	82.3	130.000	15.5	1397	13653
2216	76.000	33.000	82.3	140.000	16.3	1397	14115

TRLM SERIES





See page 1 for tolerances.

Bushings are available with keyways. Corners of keyways must be within "A" diameter.

Capacities are based on 300 R.P.M., 1500 hrs. L10 life.

Refer to inside cover for modifications or special designs.

Specify I.D. size required when ordering.

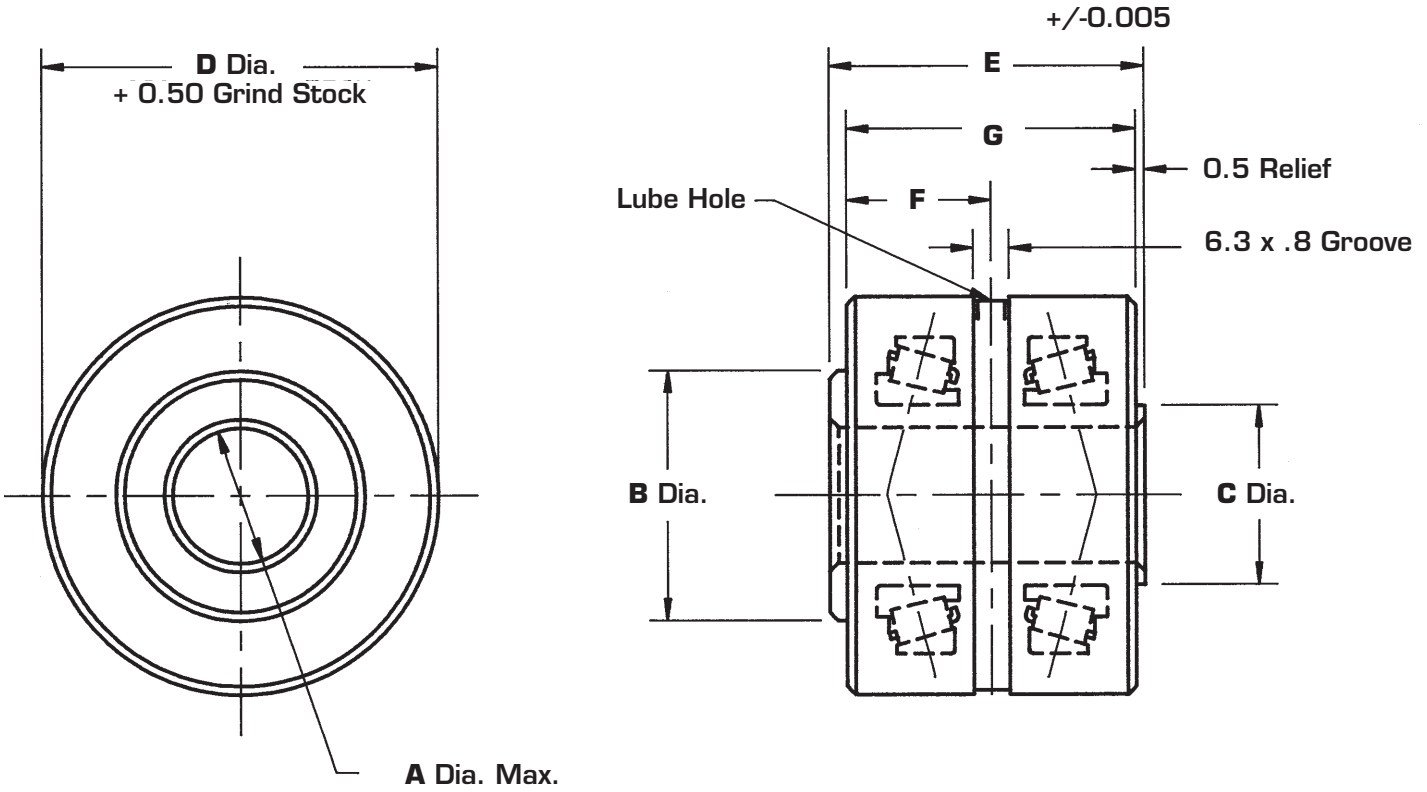
Specify "B" (inner liner length) if other than standard shown in tabulation.

Always choose the largest bushing which will fit the application for maximum rigidity.

TRLM No	A MAX	B	C	D	E	MAX. SPD. R.P.M.	RADIAL N
3206	25.000	44.450	36.6	64.000	21.6	3183	9110
3207	31.000	39.624	44.2	72.000	19.3	2604	8113
3208	38.000	39.624	49.5	80.000	19.3	2291	10106
3209	44.000	39.624	56.9	85.000	19.3	2046	10675
3210	44.000	39.624	56.9	90.000	19.3	2046	10675
3211	55.000	39.624	68.8	100.000	19.3	1666	11956
3212	60.000	39.624	82.3	110.000	19.3	1397	12668
3213	65.000	41.275	82.3	120.000	20.1	1397	13095
3214	70.000	50.800	94.7	128.000	24.9	1222	18504
3215	75.000	50.800	94.7	130.000	24.9	1222	18504
3216	85.000	50.800	100.8	140.000	24.9	1145	19642

TRMM SERIES

MEDIUM DUTY MID OR OUTBOARD SUPPORT BUSHING



See page 1 for tolerances.

Bushings are available with keyways. Corners of keyways must be within "A" diameter.

Capacities are based on 300 R.P.M., 1500 hrs. L10 life.

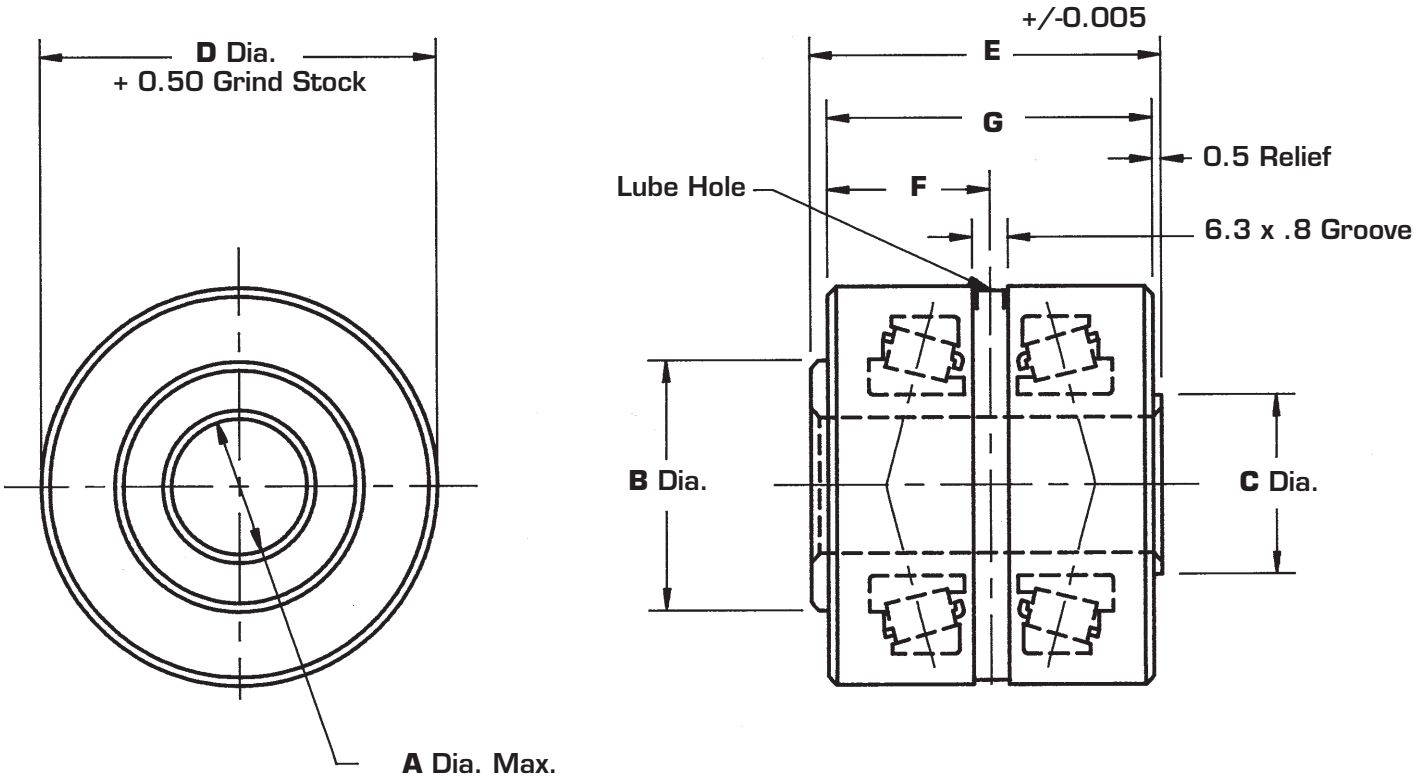
Refer to inside front cover for modifications or special designs.

Specify I.D. size required when ordering.

Specify "E" (inner liner length) if other than standard shown in tabulation.

Always choose the largest bushing which will fit the application for maximum rigidity.

TRMM No	A MAX	B	C	D	E	F	G	MAX. SPD. R.P.M.	RADIAL N
404-00	14.000	28.2	18.8	44.000	47.752	22.6	44.2	3440	3781
405-0	14.000	28.2	18.8	52.000	47.752	22.6	44.2	3440	3781
407-1	19.000	34.5	25.1	59.000	53.848	25.4	50.3	2810	8274
408-2	26.000	43.9	31.5	70.000	54.610	25.4	51.1	2200	11210
410-3	32.000	50.3	37.8	81.000	51.562	26.2	48.0	1920	15875
412-4	38.000	56.4	44.2	89.000	60.960	28.7	57.4	1710	14234
413-5	41.000	62.7	50.5	92.000	62.484	29.5	58.9	1540	19038
414-6	47.000	69.6	56.9	98.000	66.548	31.5	63.0	1400	19995
415-7	47.000	69.6	56.9	106.000	71.374	34.0	67.8	1400	19995
417-8	54.000	75.4	63.2	117.000	76.200	36.3	72.6	1280	32383
418-9	60.000	88.1	69.6	127.000	77.724	37.1	74.2	1280	32383
420-10	69.000	88.1	77.5	132.000	79.248	37.8	75.7	1100	29536
421-11	76.000	100.8	83.1	138.000	80.772	38.6	77.2	1000	36653
421-12	76.000	100.8	83.1	148.000	80.772	38.6	77.2	1000	36653
422-13	86.000	107.7	95.0	159.000	94.996	45.7	91.4	2630	50532
422-14	86.000	107.7	95.0	168.000	94.996	45.7	91.7	2630	50532
423-15	95.000	133.4	114.0	178.000	102.870	49.8	99.3	2190	49820
423-16	95.000	133.4	114.0	189.000	103.124	49.8	99.6	2190	49820
423-17	95.000	133.4	114.0	200.000	103.124	49.8	99.6	2190	49820
424-18	106.000	132.1	120.4	210.000	111.252	52.8	105.9	2190	49820



See page 1 for tolerances.

Bushings are available with keyways. Corners of keyways must be within "A" diameter.

Capacities are based on 300 R.P.M., 1500 hrs. L10 life.

Refer to inside front cover for modifications or special designs.

Specify I.D. size required when ordering.

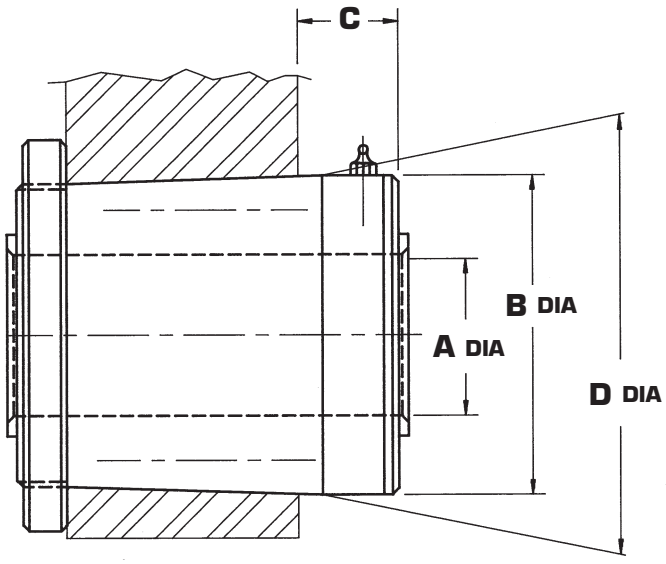
Specify "E" (inner liner length) if other than standard shown in tabulation.

Always choose the largest bushing which will fit the application for maximum rigidity.

TRHM No	A MAX	B	C	D	E	F	G	MAX. SPD. R.P.M.	RADIAL N
504	14.000	28.2	18.80	48.000	54.610	25.7	51.1	3440	5427
505	14.000	28.2	18.80	51.000	54.610	25.7	51.1	3440	5427
506	19.000	34.5	25.15	59.000	59.436	28.2	55.9	2810	11921
507	19.000	34.5	25.15	64.000	60.198	28.7	56.6	2810	11921
509	26.000	43.9	31.50	70.000	61.976	29.5	58.4	2200	16146
511	32.000	50.3	37.85	81.000	84.328	40.4	79.5	1920	22774
512	38.000	56.4	44.20	86.000	82.042	38.6	77.2	1710	20416
513	41.000	62.7	50.55	92.000	82.042	38.6	77.2	1540	27400
514	47.000	69.1	56.90	98.000	83.566	39.4	78.7	1400	27400
515	47.000	69.1	56.90	105.000	85.090	40.1	80.3	1400	28690
516	50.000	75.4	60.07	114.000	94.742	45.0	89.9	1280	46482
517	54.000	75.4	63.25	117.000	94.742	45.0	89.9	1280	39632
518	60.000	88.1	69.60	127.000	95.250	45.2	90.4	1100	42389
519	60.000	88.1	69.60	130.000	94.996	45.2	90.2	1100	42389
520	69.000	88.1	77.52	133.000	99.568	47.5	94.7	1100	52620
521	76.000	100.8	83.08	137.000	104.394	49.8	99.6	1000	52620
522	86.000	109.7	95.00	162.000	117.094	56.1	112.3	2630	72547
524	106.000	132.1	120.40	184.000	125.730	60.5	120.9	2190	71524
527	119.000	150.6	133.10	203.000	138.176	66.5	132.8	1910	139979
532	146.000	182.4	158.50	254.000	153.162	73.2	146.3	1580	154301
534	177.000	213.9	196.60	280.000	165.100	79.2	158.2	1300	159416
535	177.000	213.9	196.60	298.000	165.100	79.2	158.2	1300	159416

TAPERED ARBOR BUSHINGS

USED ON STAND-ALONE HORIZONTAL MILLING MACHINES



See page 1 for tolerances

I.D. reducing bushings are available.
Contact Gatco for details

BUSHING NO.	LARGE DIA. D	ARBOR A	BODY DIA. B	EXTD. LGTH. C
BROWN & SHARPE Milling Machines				
Following arbor bushing adaptable to B&S model #000				
B & S-1-100-	67.46	25.40	68.24	20.62
Following arbor bushings adaptable to B&S model #2 @ 3HP, #0, and #20				
B & S-2-100-	68.24	25.40	69.85	31.75
B & S-2-125-	68.24	31.75	69.85	31.75
Following arbor bushings adaptable to B&S model #2 @ 5HP, #12 @3 and 7.5HP				
B & S-3-100-	69.85	25.40	71.42	22.22
B & S-3-125-	69.85	31.75	71.42	22.22
B & S-3-150-	69.85	38.10	71.42	22.22
CINCINNATI Milling Machines				
Following arbor bushings adaptable to Cincinnati model #0-8				
C2-08-100-N	63.50	25.40	63.50	34.92
C2-08-125-N	63.50	31.75	63.50	34.92
Following arbor bushings adaptable to Cincinnati model #1-18				
C2-18-100-N	63.50	25.40	63.50	19.05
C2-18-125-N	63.50	31.75	63.50	19.05
Following arbor bushings adaptable to Cincinnati model #3, #4, #5 and #6 series				
C3-100-N	82.55	25.40	82.55	19.05
C3-125-N	82.55	31.75	82.55	19.05
C3-150-N	82.55	38.10	82.55	19.05
C4-200-N	100.78	50.80	101.60	31.75
KEMPSMITH Milling Machines				
Following arbor bushings adaptable to model #KMB and #KMC				
K3-100-N	71.42	25.40	71.42	19.05
K3-125-N	71.42	31.75	71.42	19.05
K3-150-N	71.42	38.10	71.42	19.05
MILWAUKEE Milling Machines				
M3-100-N	63.50	25.40	65.07	23.79
M3-125-N	63.50	31.75	65.07	23.79
M4-100-N	73.02	25.40	74.59	23.79
M4-125-N	73.02	31.75	74.59	23.79
M4-150-N	73.02	38.10	74.59	23.79
M5-125-N	88.90	31.75	90.47	34.92
M5-150-N	88.90	38.10	90.47	34.92
M6-200-N	112.69	50.80	114.30	38.10

BUSHING NO.	LARGE DIA. D	ARBOR A	BODY DIA. B	EXTD. LGTH. C
SUNSTRAND Milling Machines				
Following arbor bushing adaptable to model #0 and #00				
S-100-N	55.54	25.40	56.33	17.44
Following arbor bushings adaptable to model #1 and #1C				
S1-100-N	63.50	25.40	64.28	17.44
S1-125-N	63.50	31.75	64.28	17.44
Following arbor bushings adaptable to model #22				
S22-100-N	73.02	25.40	73.81	33.32
S22-125-N	73.02	31.75	73.81	33.32
S22-150-N	73.02	38.10	73.81	33.32
Following arbor bushings adaptable to model#33				
S33-100-N	85.72	25.40	86.51	26.97
S33-125-N	85.72	31.75	86.51	26.97
S33-150-N	85.72	38.10	86.51	26.97
S33-200-N	85.72	50.80	86.51	26.97
Following arbor bushings adaptable to model #C2 and #C3				
SC2-100-N	85.72	25.40	86.51	14.27
SC2-125-N	85.72	31.75	86.51	14.27
SC2-150-N	85.72	38.10	86.51	14.27
SC2-200-N	85.72	50.80	86.51	14.27
Following arbor bushing adaptable to model #35, #55, #C4 and #C5				
S35-200-N	101.60	50.80	102.38	47.62
Following arbor bushing adaptable to model #C5 with 7.8cm support arm				
SC5-300-N	123.82	76.20	123.82	15.87