



List 3690 : Ball End, Regular Length, 2 Flute, Long Neck, Rib Processing

List 3790 : Ball End, Regular Length, 2 Flute, Long Neck, Rib Processing

Standard Milling

Hardness		-		<32 HRC		33-41 HRC		42-50 HRC									
Work Material		Aluminum Copper Alloy		Cast Iron, Carbon Steel, Alloy Steel, Stainless Steel, Die Steel		Prehardened & Hardened Steel											
Cutting Speed		90-460 SFM		80-340 SFM		80-280 SFM		80-280 SFM									
Depth of Cut																	
Mill Dia.	L1 (mm)	Speed RPM	Feed in/min	aa (in)	ar (in)	Speed RPM	Feed in/min	aa (in)	ar (in)	Speed RPM	Feed in/min	aa (in)	ar (in)	Speed RPM	Feed in/min	aa (in)	ar (in)
0.1	0.3	25,000	4.6	0.0002	0.0002	25,000	2.3	0.0002	0.0002	25,000	1.5	0.0002	0.0002	25,000	1.1	0.0002	0.0002
0.1	0.5	25,000	3.7	0.0002	0.0002	25,000	1.8	0.0002	0.0002	25,000	1.2	0.0002	0.0002	25,000	0.8	0.0002	0.0002
0.2	0.3	25,000	9.2	0.0008	0.0008	25,000	6.2	0.0004	0.0004	25,000	6.2	0.0004	0.0004	25,000	6.2	0.0002	0.0002
0.2	0.5	25,000	9.2	0.0008	0.0008	25,000	6.2	0.0004	0.0004	25,000	6.2	0.0004	0.0004	25,000	6.2	0.0002	0.0002
0.2	0.75	25,000	9.2	0.0008	0.0008	25,000	6.2	0.0004	0.0004	25,000	6.2	0.0004	0.0004	25,000	3.1	0.0002	0.0002
0.2	1	25,000	4.6	0.0008	0.0008	25,000	3.1	0.0004	0.0004	25,000	3.1	0.0004	0.0004	25,000	2.5	0.0002	0.0002
0.2	1.25	25,000	4.6	0.0008	0.0008	25,000	3.1	0.0004	0.0004	25,000	3.1	0.0004	0.0004	25,000	2.5	0.0002	0.0002
0.2	1.5	25,000	4.6	0.0008	0.0008	25,000	3.1	0.0004	0.0004	25,000	3.1	0.0004	0.0004	25,000	2.5	0.0002	0.0002
0.2	1.75	25,000	4.6	0.0008	0.0008	25,000	3.1	0.0004	0.0004	25,000	3.1	0.0004	0.0004	25,000	2.5	0.0002	0.0002
0.2	2	25,000	4.6	0.0004	0.0004	25,000	3.1	0.0002	0.0002	25,000	3.1	0.0002	0.0002	25,000	2.5	0.0002	0.0002
0.2	2.5	25,000	2.3	0.0004	0.0004	25,000	1.5	0.0002	0.0002	25,000	1.5	0.0002	0.0002	25,000	1.2	0.0001	0.0002
0.2	3	25,000	2.3	0.0004	0.0004	25,000	1.5	0.0002	0.0002	25,000	1.5	0.0002	0.0002	25,000	1.2	0.0001	0.0002
0.3	0.5	25,000	18.5	0.0008	0.0012	25,000	12.3	0.0004	0.0006	25,000	9.2	0.0004	0.0006	25,000	9.2	0.0002	0.0002
0.3	0.6	25,000	18.5	0.0008	0.0012	25,000	12.3	0.0004	0.0006	25,000	9.2	0.0004	0.0006	25,000	9.2	0.0002	0.0002
0.3	0.75	25,000	18.5	0.0008	0.0012	25,000	12.3	0.0004	0.0006	25,000	9.2	0.0004	0.0006	25,000	9.2	0.0002	0.0002
0.3	1	25,000	13.8	0.0008	0.0012	25,000	9.2	0.0004	0.0006	25,000	6.2	0.0004	0.0006	25,000	6.2	0.0002	0.0002
0.3	1.25	25,000	13.8	0.0008	0.0012	25,000	9.2	0.0004	0.0006	25,000	6.2	0.0004	0.0006	25,000	6.2	0.0002	0.0002
0.3	1.5	25,000	13.8	0.0008	0.0012	25,000	9.2	0.0004	0.0006	25,000	6.2	0.0004	0.0006	25,000	6.2	0.0002	0.0002
0.3	1.75	25,000	13.8	0.0008	0.0012	25,000	9.2	0.0004	0.0006	25,000	6.2	0.0004	0.0006	25,000	6.2	0.0002	0.0002
0.3	2	25,000	13.8	0.0008	0.0012	25,000	9.2	0.0004	0.0006	25,000	6.2	0.0004	0.0006	25,000	6.2	0.0002	0.0002
0.3	2.25	25,000	13.8	0.0008	0.0008	25,000	9.2	0.0004	0.0004	25,000	6.2	0.0004	0.0004	25,000	6.2	0.0004	0.0004
0.3	2.5	25,000	13.8	0.0008	0.0008	25,000	9.2	0.0004	0.0004	25,000	6.2	0.0004	0.0004	25,000	6.2	0.0004	0.0004
0.3	2.75	25,000	13.8	0.0008	0.0008	25,000	9.2	0.0004	0.0004	25,000	6.2	0.0004	0.0004	25,000	6.2	0.0004	0.0004
0.3	3	25,000	13.8	0.0008	0.0008	25,000	9.2	0.0004	0.0004	25,000	6.2	0.0004	0.0004	25,000	6.2	0.0002	0.0004
0.3	3.5	25,000	8.3	0.0008	0.0008	25,000	5.5	0.0004	0.0004	25,000	3.7	0.0004	0.0004	25,000	3.7	0.0002	0.0004
0.3	4	25,000	8.3	0.0008	0.0008	25,000	5.5	0.0004	0.0004	25,000	3.7	0.0004	0.0004	25,000	3.7	0.0002	0.0002
0.3	4.5	25,000	8.3	0.0008	0.0008	25,000	5.5	0.0004	0.0004	25,000	3.7	0.0004	0.0004	25,000	3.7	0.0001	0.0002
0.3	5	25,000	4.6	0.0004	0.0008	25,000	3.1	0.0002	0.0004	25,000	2.2	0.0002	0.0004	25,000	2.2	0.0001	0.0002
0.4	0.5	25,000	23.1	0.0010	0.0020	25,000	15.4	0.0006	0.0010	25,000	12.3	0.0006	0.0008	25,000	12.3	0.0004	0.0004
0.4	0.75	25,000	23.1	0.0010	0.0020	25,000	15.4	0.0006	0.0010	25,000	12.3	0.0006	0.0008	25,000	12.3	0.0004	0.0004
0.4	1	25,000	18.5	0.0010	0.0020	25,000	12.3	0.0006	0.0010	25,000	9.2	0.0006	0.0008	25,000	9.2	0.0004	0.0004
0.4	1.5	25,000	18.5	0.0010	0.0020	25,000	12.3	0.0006	0.0010	25,000	9.2	0.0006	0.0008	25,000	9.2	0.0004	0.0004
0.4	2	25,000	16.4	0.0010	0.0020	25,000	10.9	0.0006	0.0010	25,000	7.3	0.0006	0.0008	25,000	7.3	0.0004	0.0004
0.4	2.5	25,000	16.4	0.0010	0.0020	25,000	10.9	0.0006	0.0010	25,000	7.3	0.0006	0.0008	25,000	7.3	0.0004	0.0004
0.4	3	25,000	16.4	0.0010	0.0020	25,000	10.9	0.0006	0.0010	25,000	7.3	0.0006	0.0008	25,000	7.3	0.0004	0.0004
0.4	3.5	25,000	16.4	0.0010	0.0020	25,000	10.9	0.0006	0.0010	25,000	7.3	0.0006	0.0008	25,000	7.3	0.0004	0.0004
0.4	4	25,000	16.4	0.0004	0.0012	25,000	10.9	0.0002	0.0006	25,000	7.3	0.0002	0.0005	25,000	7.3	0.0002	0.0004
0.4	4.5	24,000	11.8	0.0004	0.0012	25,000	7.3	0.0002	0.0006	25,000	3.6	0.0002	0.0005	25,000	3.6	0.0002	0.0004
0.4	5	24,000	11.8	0.0004	0.0012	25,000	7.3	0.0002	0.0006	25,000	3.6	0.0002	0.0005	25,000	3.6	0.0002	0.0004
0.4	5.5	21,000	11.8	0.0004	0.0008	25,000	7.3	0.0002	0.0004	25,000	3.6	0.0002	0.0003	25,000	3.6	0.0002	0.0002
0.4	6	21,000	5.9	0.0004	0.0006	25,000	3.6	0.0002	0.0003	25,000	2.9	0.0002	0.0002	25,000	2.9	0.0001	0.0002
0.5	1	25,000	23.1	0.0016	0.0020	25,000	15.4	0.0008	0.0010	25,000	12.3	0.0008	0.0008	25,000	12.3	0.0004	0.0004
0.5	1.5	25,000	23.1	0.0016	0.0020	25,000	15.4	0.0008	0.0010	25,000	12.3	0.0008	0.0008	25,000	12.3	0.0004	0.0004
0.5	2	25,000	18.5	0.0016	0.0020	25,000	12.3	0.0008	0.0010	25,000	9.2	0.0008	0.0008	25,000	9.2	0.0004	0.0004
0.5	2.5	25,000	16.4	0.0016	0.0020	25,000	10.9	0.0008	0.0010	25,000	7.3	0.0008	0.0008	25,000	7.3	0.0004	0.0004
0.5	3	25,000	16.4	0.0016	0.0020	25,000	10.9	0.0008	0.0010	25,000	7.3	0.0008	0.0008	25,000	7.3	0.0004	0.0004
0.5	3.5	25,000	16.4	0.0016	0.0020	25,000	10.9	0.0008	0.0010	25,000	7.3	0.0008	0.0008	25,000	7.3	0.0004	0.0004
0.5	4	25,000	16.4	0.0016	0.0020	25,000	10.9	0.0008	0.0010	25,000	7.3	0.0008	0.0008	25,000	7.3	0.0004	0.0004
0.5	4.5	21,000	11.8	0.0016	0.0020	20,000	7.9	0.0008	0.0010	20,000	7.9	0.0008	0.0008	20,000	7.9	0.0004	0.0004
0.5	5	21,000	11.8	0.0016	0.0020	20,000	7.9	0.0008	0.0010	20,000	5.9	0.0008	0.0008	20,000	5.9	0.0004	0.0004
0.5	5.5	21,000	11.8	0.0008	0.0012	20,000	7.9	0.0004	0.0006	20,000	5.9	0.0004	0.0004	20,000	5.9	0.0004	0.0004
0.5	6	21,000	11.8	0.0008	0.0012	20,000	7.9	0.0004	0.0006	20,000	5.9	0.0004	0.0004	20,000	5.9	0.0004	0.0004
0.5	7	21,000	11.8	0.0008	0.0012	20,000	7.9	0.0004	0.0006	20,000	5.9	0.0004	0.0004	20,000	5.9	0.0004	0.0004

1. Use a rigid and precise machine and holder.
2. When chattering occurs, reduce the speed and feed simultaneously.
3. Use a suitable cutting fluid with high smoke retardant.

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List 3690 : Ball End, Regular Length, 2 Flute, Long Neck, Rib Processing (Continued)

List 3790 : Ball End, Regular Length, 2 Flute, Long Neck, Rib Processing (Continued)

Standard Milling

Hardness		-		<32 HRC		33-41 HRC		42-50 HRC									
Work Material		Aluminum Copper Alloy		Cast Iron, Carbon Steel, Alloy Steel, Stainless Steel, Die Steel		Prehardened & Hardened Steel											
Cutting Speed		90-460 SFM		80-340 SFM		80-280 SFM		80-280 SFM									
Depth of Cut																	
Mill Dia.	L1 (mm)	Speed RPM	Feed in/min	aa (in)	ar (in)	Speed RPM	Feed in/min	aa (in)	ar (in)	Speed RPM	Feed in/min	aa (in)	ar (in)	Speed RPM	Feed in/min	aa (in)	ar (in)
0.5	8	21,000	11.8	0.0008	0.0012	15,000	7.9	0.0004	0.0006	15,000	5.9	0.0004	0.0004	15,000	5.9	0.0002	0.0002
0.5	9	18,000	5.9	0.0008	0.0008	15,000	3.9	0.0004	0.0004	15,000	3.1	0.0002	0.0004	15,000	3.1	0.0002	0.0002
0.5	10	18,000	5.9	0.0004	0.0004	15,000	3.9	0.0002	0.0002	15,000	3.1	0.0002	0.0002	15,000	3.1	0.0001	0.0002
0.6	1	25,000	27.7	0.0018	0.0047	25,000	18.5	0.0012	0.0024	25,000	15.4	0.0012	0.0020	25,000	15.4	0.0012	0.0012
0.6	1.5	25,000	27.7	0.0018	0.0047	25,000	18.5	0.0012	0.0024	25,000	15.4	0.0012	0.0020	25,000	15.4	0.0012	0.0012
0.6	2	25,000	20.8	0.0018	0.0047	25,000	13.8	0.0012	0.0024	25,000	9.2	0.0012	0.0020	25,000	9.2	0.0012	0.0012
0.6	2.5	25,000	22.1	0.0018	0.0047	25,000	13.8	0.0012	0.0024	25,000	9.2	0.0012	0.0020	25,000	9.2	0.0012	0.0012
0.6	3	25,000	12.3	0.0018	0.0047	25,000	9.8	0.0012	0.0024	24,000	7.9	0.0012	0.0020	24,000	7.9	0.0012	0.0012
0.6	3.5	25,000	12.3	0.0018	0.0047	25,000	9.8	0.0012	0.0024	24,000	7.9	0.0012	0.0016	24,000	7.9	0.0012	0.0012
0.6	4	25,000	12.3	0.0018	0.0047	25,000	9.8	0.0012	0.0024	24,000	7.9	0.0012	0.0016	24,000	7.9	0.0012	0.0012
0.6	4.5	25,000	12.3	0.0018	0.0047	25,000	9.8	0.0012	0.0024	24,000	7.9	0.0012	0.0016	24,000	7.9	0.0012	0.0012
0.6	5	25,000	12.3	0.0018	0.0047	25,000	9.8	0.0012	0.0024	24,000	7.9	0.0012	0.0016	24,000	7.9	0.0008	0.0008
0.6	5.5	25,000	11.8	0.0018	0.0047	20,000	7.9	0.0012	0.0024	20,000	7.9	0.0012	0.0016	20,000	7.9	0.0008	0.0008
0.6	6	25,000	8.9	0.0018	0.0047	20,000	5.9	0.0012	0.0024	20,000	5.9	0.0012	0.0016	20,000	5.9	0.0008	0.0008
0.6	6.5	25,000	8.9	0.0018	0.0047	20,000	5.9	0.0012	0.0024	20,000	5.9	0.0012	0.0016	20,000	5.9	0.0008	0.0008
0.6	7	25,000	8.9	0.0018	0.0047	20,000	5.9	0.0012	0.0024	20,000	5.9	0.0012	0.0016	20,000	5.9	0.0008	0.0008
0.6	7.5	25,000	8.9	0.0018	0.0047	20,000	5.9	0.0012	0.0024	20,000	5.9	0.0012	0.0016	20,000	5.9	0.0008	0.0008
0.6	8	25,000	8.9	0.0018	0.0047	20,000	5.9	0.0012	0.0024	20,000	5.9	0.0012	0.0016	20,000	5.9	0.0008	0.0008
0.6	8.5	22,000	8.9	0.0018	0.0047	20,000	5.9	0.0012	0.0024	20,000	5.9	0.0008	0.0016	20,000	5.9	0.0004	0.0004
0.6	9	22,000	8.9	0.0012	0.0039	20,000	5.9	0.0008	0.0020	20,000	5.9	0.0008	0.0016	20,000	5.9	0.0004	0.0004
0.6	9.5	22,000	8.9	0.0012	0.0039	17,000	5.9	0.0008	0.0020	17,000	5.9	0.0008	0.0016	17,000	5.9	0.0004	0.0004
0.6	10	20,000	5.9	0.0010	0.0020	17,000	3.9	0.0006	0.0010	17,000	3.9	0.0006	0.0008	17,000	3.9	0.0002	0.0002
0.6	11	20,000	5.9	0.0010	0.0020	17,000	3.9	0.0006	0.0010	17,000	3.9	0.0004	0.0008	17,000	3.9	0.0002	0.0002
0.6	12	20,000	4.7	0.0010	0.0020	17,000	3.1	0.0006	0.0010	17,000	3.1	0.0004	0.0005	17,000	3.1	0.0002	0.0002
0.8	2	25,000	24.6	0.0024	0.0063	23,000	17.7	0.0016	0.0031	21,000	11.8	0.0016	0.0024	21,000	11.8	0.0016	0.0016
0.8	3	25,000	24.6	0.0024	0.0063	23,000	17.7	0.0016	0.0031	21,000	11.8	0.0016	0.0024	21,000	11.8	0.0016	0.0016
0.8	4	25,000	24.6	0.0024	0.0063	23,000	17.7	0.0016	0.0031	21,000	11.8	0.0016	0.0024	21,000	11.8	0.0016	0.0016
0.8	5	24,000	14.8	0.0024	0.0047	21,000	9.8	0.0016	0.0024	19,000	7.9	0.0016	0.0020	19,000	7.9	0.0008	0.0010
0.8	6	24,000	14.8	0.0024	0.0047	21,000	9.8	0.0016	0.0024	19,000	7.9	0.0016	0.0020	19,000	7.9	0.0008	0.0010
0.8	7	24,000	14.8	0.0024	0.0047	21,000	9.8	0.0016	0.0024	19,000	7.9	0.0016	0.0020	19,000	7.9	0.0008	0.0010
0.8	8	22,000	8.9	0.0024	0.0047	19,000	5.9	0.0016	0.0024	17,000	5.9	0.0016	0.0020	17,000	5.9	0.0008	0.0010
0.8	9	22,000	8.9	0.0024	0.0047	19,000	5.9	0.0016	0.0024	17,000	5.9	0.0016	0.0020	17,000	5.9	0.0008	0.0010
0.8	10	22,000	8.9	0.0024	0.0047	19,000	5.9	0.0016	0.0024	17,000	5.9	0.0016	0.0020	17,000	5.9	0.0008	0.0010
0.8	12	20,000	8.9	0.0024	0.0047	19,000	5.9	0.0016	0.0024	17,000	5.9	0.0016	0.0020	17,000	5.9	0.0008	0.0010
1	2.5	25,000	31.6	0.0030	0.0079	25,000	23.6	0.0020	0.0039	21,000	15.7	0.0020	0.0031	21,000	15.7	0.0020	0.0020
1	3	25,000	26.4	0.0030	0.0079	25,000	19.7	0.0020	0.0039	21,000	11.8	0.0020	0.0031	21,000	11.8	0.0020	0.0020
1	4	25,000	26.4	0.0030	0.0079	25,000	19.7	0.0020	0.0039	21,000	11.8	0.0020	0.0031	21,000	11.8	0.0020	0.0020
1	5	21,000	17.7	0.0030	0.0079	19,000	11.8	0.0020	0.0039	16,000	7.9	0.0020	0.0031	16,000	7.9	0.0020	0.0020
1	6	21,000	17.7	0.0030	0.0079	19,000	11.8	0.0020	0.0039	16,000	7.9	0.0020	0.0031	16,000	7.9	0.0020	0.0020
1	7	21,000	17.7	0.0030	0.0059	19,000	11.8	0.0020	0.0030	16,000	7.9	0.0020	0.0024	16,000	7.9	0.0012	0.0012
1	8	21,000	17.7	0.0030	0.0059	19,000	11.8	0.0020	0.0030	16,000	7.9	0.0020	0.0024	16,000	7.9	0.0012	0.0012
1	9	21,000	17.7	0.0030	0.0059	19,000	11.8	0.0020	0.0030	16,000	7.9	0.0020	0.0024	16,000	7.9	0.0012	0.0012
1	10	18,000	11.8	0.0024	0.0047	17,000	7.9	0.0012	0.0020	14,000	5.9	0.0012	0.0016	14,000	5.9	0.0004	0.0006
1	12	18,000	11.8	0.0024	0.0047	17,000	7.9	0.0012	0.0020	14,000	5.9	0.0012	0.0016	14,000	5.9	0.0004	0.0006
1	14	18,000	11.8	0.0024	0.0047	17,000	7.9	0.0012	0.0020	14,000	5.9	0.0012	0.0016	14,000	5.9	0.0004	0.0006
1	16	16,000	11.8	0.0024	0.0047	13,000	7.9	0.0012	0.0020	10,000	5.9	0.0012	0.0016	10,000	5.9	0.0004	0.0006
1	18	16,000	11.8	0.0024	0.0047	13,000	7.9	0.0012	0.0020	10,000	5.9	0.0012	0.0016	10,000	5.9	0.0004	0.0006
1	20	16,000	11.8	0.0024	0.0047	13,000	7.9	0.0012	0.0020	10,000	5.9	0.0012	0.0016	10,000	5.9	0.0004	0.0006
1	22	16,000	8.9	0.0020	0.0020	13,000	5.9	0.0008	0.0010	10,000	3.9	0.0008	0.0008	10,000	3.9	0.0002	0.0002
1.2	4	20,000	29.5	0.0035	0.0094	17,000	19.7	0.0024	0.0047	14,000	11.8	0.0024	0.0039	14,000	11.8	0.0024	0.0024
1.2	6	20,000	17.7	0.0035	0.0094	17,000	11.8	0.0024	0.0047	14,000	7.9	0.0024	0.0039	14,000	7.9	0.0024	0.0024
1.2	8	20,000	17.7	0.0035	0.0094	17,000	11.8	0.0024	0.0047	14,000	7.9	0.0024	0.0039	14,000	7.9	0.0024	0.0024
1.2	10	20,000	17.7	0.0035	0.0071	17,000	11.8	0.0024	0.0035	14,000	7.9	0.0024	0.0028	14,000	7.9	0.0012	0.0012
1.2	12	16,000	11.8	0.0035	0.0071	14,000	7.9	0.0024	0.0035	11,000	5.9	0.0024	0.0028	11,000	5.9	0.0012	0.0012
1.2	14	16,000	11.8	0.0035	0.0071	14,000	7.9	0.0024	0.0035	11,000	5.9	0.0024	0.0028	11,000	5.9	0.0004	0.0012

1. Use a rigid and precise machine and holder.
2. When chattering occurs, reduce the speed and feed simultaneously.
3. Use a suitable cutting fluid with high smoke retardant.





Standard Milling

Hardness		-		<32 HRC		33-41 HRC		42-50 HRC									
Work Material		Aluminum Copper Alloy		Cast Iron, Carbon Steel, Alloy Steel, Stainless Steel, Die Steel		Prehardened & Hardened Steel											
Cutting Speed		90-460 SFM		80-340 SFM		80-280 SFM		80-280 SFM									
Depth of Cut																	
Mill Dia.	L1 (mm)	Speed RPM	Feed in/min	aa (in)	ar (in)	Speed RPM	Feed in/min	aa (in)	ar (in)	Speed RPM	Feed in/min	aa (in)	ar (in)	Speed RPM	Feed in/min	aa (in)	ar (in)
1.2	16	16,000	11.8	0.0035	0.0071	14,000	7.9	0.0024	0.0035	11,000	5.9	0.0024	0.0028	11,000	5.9	0.0004	0.0012
1.2	18	16,000	11.8	0.0035	0.0071	14,000	7.9	0.0024	0.0035	11,000	5.9	0.0024	0.0028	11,000	5.9	0.0004	0.0012
1.2	20	16,000	11.8	0.0035	0.0071	14,000	7.9	0.0024	0.0035	11,000	5.9	0.0024	0.0028	11,000	5.9	0.0004	0.0012
1.2	24	16,000	11.8	0.0035	0.0071	14,000	7.9	0.0024	0.0035	11,000	5.9	0.0024	0.0028	11,000	5.9	0.0004	0.0012
1.4	8	18,000	17.7	0.0039	0.0110	15,500	11.8	0.0028	0.0055	12,000	9.8	0.0028	0.0039	12,000	9.8	0.0028	0.0028
1.4	12	18,000	17.7	0.0039	0.0110	15,500	11.8	0.0028	0.0055	12,000	9.8	0.0028	0.0039	12,000	9.8	0.0028	0.0028
1.4	16	13,000	11.8	0.0035	0.0071	12,000	7.9	0.0024	0.0035	9,000	5.9	0.0016	0.0028	9,000	5.9	0.0004	0.0012
1.5	3	20,000	35.4	0.0047	0.0118	15,000	23.6	0.0031	0.0059	12,000	19.7	0.0031	0.0047	12,000	11.8	0.0031	0.0039
1.5	4	20,000	35.4	0.0047	0.0118	15,000	23.6	0.0031	0.0059	12,000	19.7	0.0031	0.0047	12,000	11.8	0.0031	0.0039
1.5	6	18,000	29.5	0.0047	0.0118	15,000	19.7	0.0031	0.0059	12,000	13.8	0.0031	0.0047	12,000	11.8	0.0031	0.0039
1.5	8	17,000	17.7	0.0047	0.0118	15,000	11.8	0.0031	0.0059	12,000	9.8	0.0031	0.0047	12,000	9.8	0.0031	0.0039
1.5	10	17,000	17.7	0.0047	0.0118	15,000	11.8	0.0031	0.0059	12,000	9.8	0.0031	0.0047	12,000	9.8	0.0031	0.0039
1.5	12	17,000	17.7	0.0047	0.0118	15,000	11.8	0.0031	0.0047	12,000	9.8	0.0031	0.0035	12,000	9.8	0.0020	0.0024
1.5	14	17,000	17.7	0.0047	0.0094	15,000	11.8	0.0031	0.0047	12,000	9.8	0.0031	0.0035	12,000	9.8	0.0020	0.0024
1.5	16	13,000	11.8	0.0035	0.0071	12,000	7.9	0.0024	0.0039	9,500	5.9	0.0024	0.0028	9,500	5.9	0.0004	0.0012
1.5	18	13,000	11.8	0.0035	0.0071	12,000	7.9	0.0024	0.0039	9,500	5.9	0.0024	0.0028	9,500	5.9	0.0004	0.0012
1.5	20	13,000	11.8	0.0035	0.0071	12,000	7.9	0.0024	0.0039	9,500	5.9	0.0024	0.0028	9,500	5.9	0.0004	0.0012
1.5	22	13,000	11.8	0.0035	0.0071	12,000	7.9	0.0024	0.0039	9,500	5.9	0.0024	0.0028	9,500	5.9	0.0004	0.0012
1.5	30	13,000	11.8	0.0035	0.0071	12,000	7.9	0.0024	0.0039	9,500	5.9	0.0024	0.0028	9,500	5.9	0.0004	0.0012
1.6	4	20,000	35.4	0.0047	0.0126	14,000	23.6	0.0031	0.0063	11,000	19.7	0.0031	0.0051	11,000	13.8	0.0031	0.0039
1.6	8	16,500	17.7	0.0047	0.0126	14,000	11.8	0.0031	0.0063	11,000	9.8	0.0031	0.0051	11,000	9.8	0.0031	0.0039
1.6	12	16,500	17.7	0.0047	0.0094	14,000	11.8	0.0031	0.0047	11,000	9.8	0.0031	0.0031	11,000	9.8	0.0020	0.0020
1.6	16	11,500	11.8	0.0047	0.0094	11,000	7.9	0.0031	0.0047	9,000	5.9	0.0031	0.0031	9,000	5.9	0.0020	0.0020
1.6	20	11,500	11.8	0.0035	0.0079	11,000	7.9	0.0024	0.0047	9,000	5.9	0.0024	0.0030	9,000	5.9	0.0006	0.0012
1.8	8	16,500	23.6	0.0051	0.0142	14,000	15.7	0.0035	0.0071	11,000	11.8	0.0035	0.0063	11,000	11.8	0.0035	0.0047
1.8	12	16,500	23.6	0.0051	0.0142	14,000	15.7	0.0035	0.0071	11,000	11.8	0.0035	0.0063	11,000	11.8	0.0035	0.0047
1.8	16	16,500	23.6	0.0051	0.0106	14,000	15.7	0.0035	0.0055	11,000	11.8	0.0035	0.0047	11,000	11.8	0.0020	0.0024
1.8	20	11,000	11.8	0.0039	0.0087	11,000	7.9	0.0024	0.0051	8,000	7.9	0.0024	0.0031	8,000	7.9	0.0008	0.0012
2	3	16,500	53.1	0.0059	0.0220	16,500	35.4	0.0039	0.0110	13,500	31.5	0.0039	0.0110	13,500	27.6	0.0039	0.0079
2	4	16,500	41.3	0.0059	0.0220	16,500	27.6	0.0039	0.0110	13,500	19.7	0.0039	0.0110	13,500	19.7	0.0039	0.0079
2	6	16,500	41.3	0.0059	0.0220	16,500	27.6	0.0039	0.0110	13,500	19.7	0.0039	0.0110	13,500	19.7	0.0039	0.0079
2	8	16,500	41.3	0.0059	0.0220	16,500	27.6	0.0039	0.0110	13,500	19.7	0.0039	0.0110	13,500	19.7	0.0039	0.0079
2	10	14,000	29.5	0.0059	0.0220	13,000	19.7	0.0039	0.0110	10,000	11.8	0.0039	0.0110	10,000	11.8	0.0039	0.0079
2	12	14,000	29.5	0.0059	0.0220	13,000	19.7	0.0039	0.0110	10,000	11.8	0.0039	0.0110	10,000	11.8	0.0039	0.0079
2	14	14,000	29.5	0.0059	0.0220	13,000	19.7	0.0039	0.0110	10,000	11.8	0.0039	0.0110	10,000	11.8	0.0039	0.0079
2	16	14,000	29.5	0.0059	0.165	13,000	19.7	0.0039	0.0083	10,000	11.8	0.0039	0.0071	10,000	11.8	0.0024	0.0039
2	18	14,000	29.5	0.0059	0.165	13,000	19.7	0.0039	0.0083	10,000	11.8	0.0039	0.0071	10,000	11.8	0.0024	0.0039
2	20	11,000	14.8	0.0059	0.165	10,000	9.8	0.0039	0.0083	8,000	7.9	0.0039	0.0071	8,000	7.9	0.0024	0.0039
2	22	11,000	14.8	0.0059	0.165	10,000	9.8	0.0039	0.0083	8,000	7.9	0.0039	0.0071	8,000	7.9	0.0024	0.0039
2	25	11,000	14.8	0.0059	0.165	10,000	9.8	0.0039	0.0083	8,000	7.9	0.0039	0.0071	8,000	7.9	0.0024	0.0039
2	30	11,000	14.8	0.0059	0.165	10,000	9.8	0.0039	0.0083	8,000	7.9	0.0039	0.0071	8,000	7.9	0.0024	0.0039
2	35	10,000	14.8	0.0059	0.165	10,000	9.8	0.0039	0.0083	8,000	7.9	0.0039	0.0071	8,000	7.9	0.0024	0.0039
2	40	10,000	11.8	0.0059	0.165	10,000	7.9	0.0039	0.0083	8,000	6.3	0.0039	0.0071	8,000	6.3	0.0024	0.0039
2.5	6	16,000	41.3	0.0071	0.0276	12,000	27.6	0.0047	0.0138	10,000	23.6	0.0047	0.0118	10,000	23.6	0.0039	0.0098
2.5	10	14,000	41.3	0.0071	0.0276	12,000	27.6	0.0047	0.0138	10,000	23.6	0.0047	0.0118	10,000	23.6	0.0039	0.0098
2.5	15	14,000	23.6	0.0071	0.0276	10,000	15.7	0.0047	0.0138	8,500	11.8	0.0047	0.0118	8,500	11.8	0.0039	0.0098
2.5	20	12,000	23.6	0.0071	0.0220	10,000	15.7	0.0047	0.0110	8,500	11.8	0.0047	0.0079	8,500	11.8	0.0031	0.0059
2.5	25	12,000	17.7	0.0071	0.0220	8,000	11.8	0.0047	0.0110	6,500	9.8	0.0047	0.0079	6,500	9.8	0.0031	0.0059
2.5	30	12,000	14.8	0.0071	0.0220	8,000	9.8	0.0047	0.0110	6,500	7.9	0.0047	0.0079	6,500	7.9	0.0031	0.0059
2.5	35	12,000	14.8	0.0071	0.0220	8,000	9.8	0.0047	0.0110	6,500	7.9	0.0047	0.0079	6,500	7.9	0.0031	0.0059
3	6	15,000	47.2	0.0079	0.0331	9,500	31.5	0.0059	0.0165	7,500	23.6	0.0059	0.0165	7,500	23.6	0.0059	0.0118
3	8	12,000	35.4	0.0079	0.0331	9,500	23.6	0.0059	0.0165	7,500	15.7	0.0059	0.0142	7,500	15.7	0.0059	0.0118
3	10	12,000	35.4	0.0079	0.0331	9,500	23.6	0.0059	0.0165	7,500	15.7	0.0059	0.0142	7,500	15.7	0.0059	0.0118
3	12	10,000	35.4	0.0079	0.0331	9,500	23.6	0.0059	0.0165	7,500	15.7	0.0059	0.0142	7,500	15.7	0.0059	0.0118

1. Use a rigid and precise machine and holder.
2. When chattering occurs, reduce the speed and feed simultaneously.
3. Use a suitable cutting fluid with high smoke retardant.

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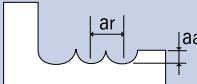




List 3690 : Ball End, Regular Length, 2 Flute, Long Neck, Rib Processing (Continued)

List 3790 : Ball End, Regular Length, 2 Flute, Long Neck, Rib Processing (Continued)

Standard Milling

Hardness		-				<32 HRC				33-41 HRC				42-50 HRC			
Work Material		Aluminum Copper Alloy				Cast Iron, Carbon Steel, Alloy Steel, Stainless Steel, Die Steel				Prehardened & Hardened Steel							
Cutting Speed		90-460 SFM				80-340 SFM				80-280 SFM				80-280 SFM			
Depth of Cut																	
Mill Dia.	L1 (mm)	Speed RPM	Feed in/min	aa (in)	ar (in)	Speed RPM	Feed in/min	aa (in)	ar (in)	Speed RPM	Feed in/min	aa (in)	ar (in)	Speed RPM	Feed in/min	aa (in)	ar (in)
3	14	10,000	35.4	0.0079	0.0331	9,500	23.6	0.0059	0.0165	7,500	15.7	0.0059	0.0142	7,500	15.7	0.0059	0.0118
3	15	10,000	23.6	0.0079	0.0331	8,500	15.7	0.0059	0.0165	6,500	9.8	0.0059	0.0142	6,500	9.8	0.0059	0.0118
3	16	10,000	17.7	0.0079	0.0331	8,500	11.8	0.0059	0.0165	6,500	9.8	0.0059	0.0142	6,500	9.8	0.0059	0.0118
3	20	10,000	17.7	0.0079	0.0331	8,500	11.8	0.0059	0.0165	6,500	9.8	0.0059	0.0142	6,500	9.8	0.0059	0.0118
3	25	10,000	17.7	0.0079	0.0331	8,500	11.8	0.0059	0.0165	6,500	9.8	0.0059	0.0118	6,500	9.8	0.0035	0.0059
3	30	9,000	14.8	0.0079	0.0331	7,500	9.8	0.0059	0.0165	6,000	7.9	0.0059	0.0118	6,000	7.9	0.0035	0.0059
3	35	9,000	14.8	0.0079	0.0331	7,500	9.8	0.0059	0.0165	6,000	7.9	0.0059	0.0118	6,000	7.9	0.0035	0.0059
3	40	9,000	14.8	0.0079	0.0331	7,500	9.8	0.0059	0.0165	6,000	7.9	0.0059	0.0118	6,000	7.9	0.0035	0.0059
3.5	10	10,000	41.3	0.0157	0.0386	8,500	27.6	0.0059	0.0193	6,500	19.7	0.0059	0.0165	6,500	19.7	0.0059	0.0138
3.5	15	10,000	35.4	0.0157	0.0386	8,500	23.6	0.0059	0.0193	6,500	15.7	0.0059	0.0165	6,500	15.7	0.0059	0.0138
3.5	20	8,000	29.5	0.0157	0.0386	7,500	19.7	0.0059	0.0193	5,500	11.8	0.0059	0.0165	5,500	11.8	0.0059	0.0138
3.5	25	8,000	23.6	0.0157	0.0386	7,500	15.7	0.0059	0.0193	5,500	10.8	0.0059	0.0165	5,500	10.8	0.0059	0.0138
3.5	30	8,000	17.7	0.0157	0.0386	7,500	11.8	0.0059	0.0193	5,500	9.8	0.0059	0.0138	5,500	9.8	0.0039	0.0079
3.5	35	8,000	14.8	0.0157	0.0386	6,000	9.8	0.0059	0.0193	5,000	7.9	0.0059	0.0138	5,000	7.9	0.0039	0.0079
3.5	40	6,000	14.8	0.0118	0.0386	6,000	9.8	0.0059	0.0193	5,000	7.9	0.0059	0.0138	5,000	7.9	0.0039	0.0079
3.5	45	6,000	14.8	0.0118	0.0386	6,000	9.8	0.0059	0.0193	5,000	7.9	0.0059	0.0138	5,000	7.9	0.0039	0.0079
4	8	11,000	47.2	0.0197	0.0504	7,500	31.5	0.0079	0.0252	6,000	27.6	0.0079	0.0236	6,000	27.6	0.0079	0.0157
4	10	9,000	35.4	0.0197	0.0504	7,500	23.6	0.0079	0.0252	6,000	15.7	0.0079	0.0236	6,000	15.7	0.0079	0.0157
4	12	9,000	35.4	0.0197	0.0504	7,500	23.6	0.0079	0.0252	6,000	15.7	0.0079	0.0236	6,000	15.7	0.0079	0.0157
4	14	9,000	35.4	0.0197	0.0504	7,500	23.6	0.0079	0.0252	6,000	15.7	0.0079	0.0236	6,000	15.7	0.0079	0.0157
4	15	9,000	35.4	0.0197	0.0504	7,500	23.6	0.0079	0.0252	6,000	15.7	0.0079	0.0236	6,000	15.7	0.0079	0.0157
4	16	9,000	35.4	0.0197	0.0504	7,500	23.6	0.0079	0.0252	6,000	15.7	0.0079	0.0236	6,000	15.7	0.0079	0.0157
4	20	7,000	23.6	0.0197	0.0504	6,000	15.7	0.0079	0.0252	5,000	9.8	0.0079	0.0236	5,000	9.8	0.0079	0.0157
4	25	7,000	23.6	0.0197	0.0504	6,000	15.7	0.0079	0.0252	5,000	9.8	0.0079	0.0236	5,000	9.8	0.0079	0.0157
4	30	7,000	23.6	0.0157	0.0504	6,000	15.7	0.0079	0.0252	5,000	9.8	0.0079	0.0220	5,000	9.8	0.0047	0.0079
4	35	7,000	23.6	0.0157	0.0504	6,000	15.7	0.0079	0.0252	5,000	9.8	0.0079	0.0220	5,000	9.8	0.0047	0.0079
4	40	5,000	14.8	0.0138	0.0504	5,000	9.8	0.0079	0.0252	4,000	7.9	0.0079	0.0220	4,000	7.9	0.0047	0.0079
4	45	5,000	14.8	0.0138	0.0504	5,000	9.8	0.0079	0.0252	4,000	7.9	0.0079	0.0220	4,000	7.9	0.0047	0.0079
4	50	5,000	14.8	0.0138	0.0504	5,000	9.8	0.0079	0.0252	4,000	7.9	0.0079	0.0220	4,000	7.9	0.0047	0.0079
5	10	9,000	53.1	0.0236	0.0709	6,500	35.4	0.0098	0.0354	5,000	29.5	0.0098	0.0276	5,000	29.5	0.0098	0.0197
5	15	9,000	53.1	0.0236	0.0709	6,500	35.4	0.0098	0.0354	5,000	29.5	0.0098	0.0276	5,000	29.5	0.0098	0.0197
5	20	7,000	29.5	0.0236	0.0709	6,500	19.7	0.0098	0.0354	5,000	15.7	0.0098	0.0276	5,000	15.7	0.0098	0.0197
5	25	6,000	29.5	0.0236	0.0709	5,000	19.7	0.0098	0.0354	4,000	9.8	0.0098	0.0276	4,000	9.8	0.0098	0.0197
5	30	6,000	29.5	0.0236	0.0709	5,000	19.7	0.0098	0.0354	4,000	9.8	0.0098	0.0276	4,000	9.8	0.0098	0.0197
5	35	6,000	29.5	0.0236	0.0709	5,000	19.7	0.0098	0.0354	4,000	9.8	0.0098	0.0276	4,000	9.8	0.0098	0.0197
5	40	5,000	23.6	0.0157	0.0709	4,000	15.7	0.0098	0.0354	4,000	7.9	0.0098	0.0236	4,000	7.9	0.0079	0.0098
5	45	5,000	23.6	0.0157	0.0709	4,000	15.7	0.0098	0.0354	4,000	7.9	0.0098	0.0236	4,000	7.9	0.0079	0.0098
5	50	5,000	17.7	0.0157	0.0709	4,000	11.8	0.0098	0.0354	4,000	7.9	0.0098	0.0236	4,000	7.9	0.0079	0.0098
6	10	7,000	59.1	0.0295	0.0945	5,500	39.4	0.0118	0.0472	4,500	31.5	0.0118	0.0378	4,500	31.5	0.0118	0.0236
6	20	7,000	47.2	0.0295	0.0945	5,500	31.5	0.0118	0.0472	4,500	23.6	0.0118	0.0378	4,500	23.6	0.0118	0.0236
6	25	6,000	35.4	0.0295	0.0945	5,500	23.6	0.0118	0.0472	4,500	15.7	0.0118	0.0378	4,500	15.7	0.0118	0.0236
6	30	5,000	23.6	0.0295	0.0945	4,000	15.7	0.0118	0.0472	4,000	11.8	0.0118	0.0378	4,000	11.8	0.0118	0.0236
6	35	5,000	23.6	0.0295	0.0945	4,000	15.7	0.0118	0.0472	4,000	11.8	0.0118	0.0378	4,000	11.8	0.0118	0.0236
6	40	5,000	23.6	0.0236	0.0945	4,000	15.7	0.0118	0.0472	4,000	11.8	0.0118	0.0378	4,000	11.8	0.0118	0.0236
6	45	5,000	23.6	0.0236	0.0945	4,000	15.7	0.0118	0.0472	4,000	11.8	0.0118	0.0378	4,000	11.8	0.0118	0.0236
6	50	5,000	23.6	0.0236	0.0945	4,000	15.7	0.0118	0.0472	4,000	11.8	0.0118	0.0378	4,000	11.81	0.0118	0.0118

1. Use a rigid and precise machine and holder.
2. When chattering occurs, reduce the speed and feed simultaneously.
3. Use a suitable cutting fluid with high smoke retardant.

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