

**YE-X1EH24** METRIC

**W/G**  
**X<sup>1</sup>-EH**

**FINE-FINISHING SOLID CARBIDE END MILLS  
FOR HIGH HARDENED STEEL**

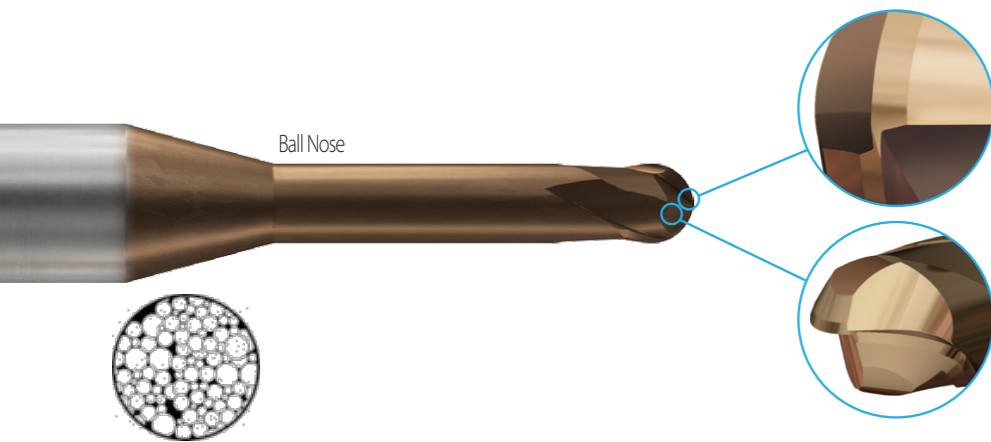
- /// **Highest Accuracy for all Semi/Fine-Finishing application challenges**
- /// **Extensive Portfolio perfectly serving the Die&Mold Industry needs**
- /// **Latest Substrate and Coating Technology for predictive and extraordinary Tool Life**



# PREMIUM X<sup>1</sup>-EH

Exceptionally Highly Accurate Micro Tooling  
C-coated Nano Grain Solid Carbide End Mills

- >800 different variants allow Length-to-Diameter and Stick-out optimization of Fine-Finishing applications without compromises
- Total High Accuracy setup including not only ball accuracy but shank, neck and conical transition accuracy



### Ball Nose Gash Transition NEW

▶ Optimized transition from end mill center to flute for improved chip flow.

### Reinforced Back Relief NEW

▶ Strengthened cutting edge design for greater stability while not interfering with chip flow.

### Corner Geometries

▶ YG-1's High performance corner geometries, including corner radius, for longer tool life in high-hardness machining.

### Edge Preparation

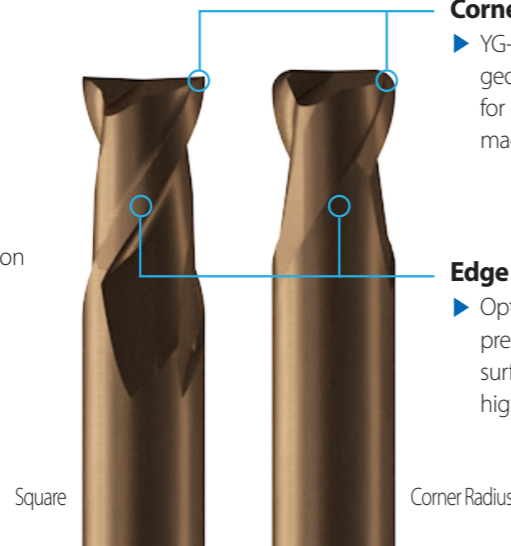
▶ Optimal edge preparation applied to prevent chipping and achieve excellent surface finishes with longer tool life in high speed machining.

### Raw Material

▶ Newly developed fine-grain nanostructure substrate for improved thermal shock stability and higher hardness.

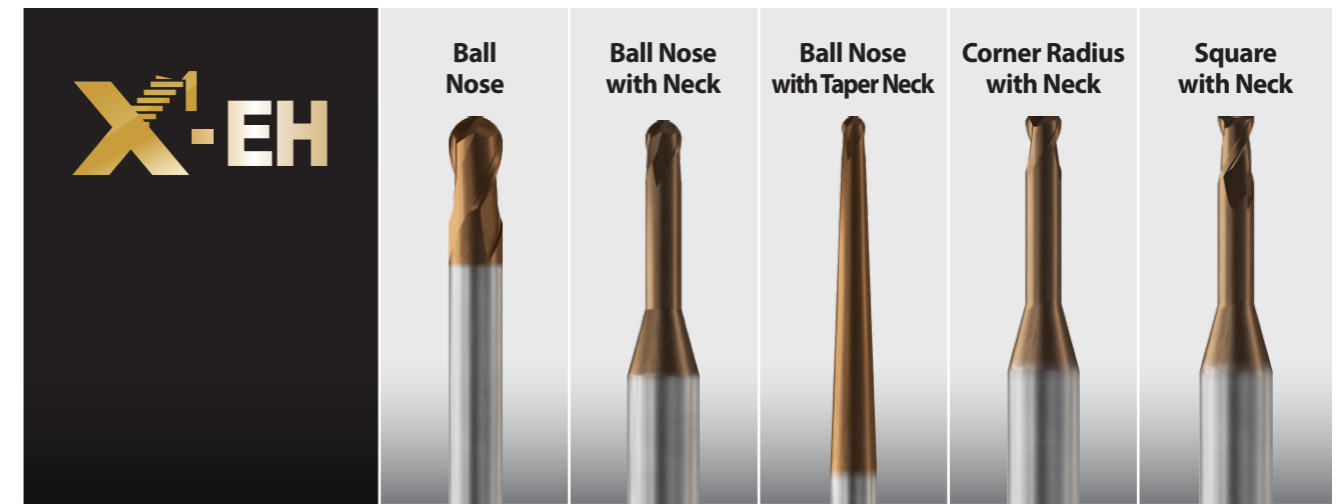
### Special High Technology Coating NEW

▶ Excellent wear and heat resistance with improved thermal shock stability. The nanolayer structure prevents the propagation of microcracks and coating elasticity promotes increased tool life.



Square

Corner Radius



### Cutting Portion Accuracy

Ball Nose	Ball Nose with Neck	Ball Nose with Taper Neck	Corner Radius with Neck	Square with Neck
$\leq \varnothing 6\text{mm}$ $+1\mu\text{m} \sim -5\mu\text{m}$	$\leq \varnothing 6\text{mm}$ $+1\mu\text{m} \sim -5\mu\text{m}$	$< \varnothing 6\text{mm}$ $+1\mu\text{m} \sim -5\mu\text{m}$	$< \varnothing 6\text{mm}$ $\pm 5\mu\text{m}$	
$> \varnothing 6\text{mm}$ $+3\mu\text{m} \sim -7\mu\text{m}$		$> \varnothing 6\text{mm}$ $+3\mu\text{m} \sim -7\mu\text{m}$		

### Shank Accuracy

Size	Shank Dia. Tolerance
up to $\varnothing 6$	h4
over $\varnothing 6$	h5

Coating	Coating Color	Coating Type	Hardness (Hv)	Max. Usage Temperature (°C)	Friction Coefficient (dry)	Coating Thickness (μm)	General Information
C-Coating	Reddish Brown	Si-based	3,900	1,000	0.40	0.5 ~ 3.0	<ul style="list-style-type: none"> <li>• Improved Hardness and Toughness</li> <li>• High Thermal Stability and Oxidation Resistance</li> <li>• Nanolayer Structure prevents Propagation of Microcracks</li> <li>• Extra-hard Surface with Good Anti-Friction Properties and a Low Tendency to Stick to the Machined Workpiece Material</li> </ul>

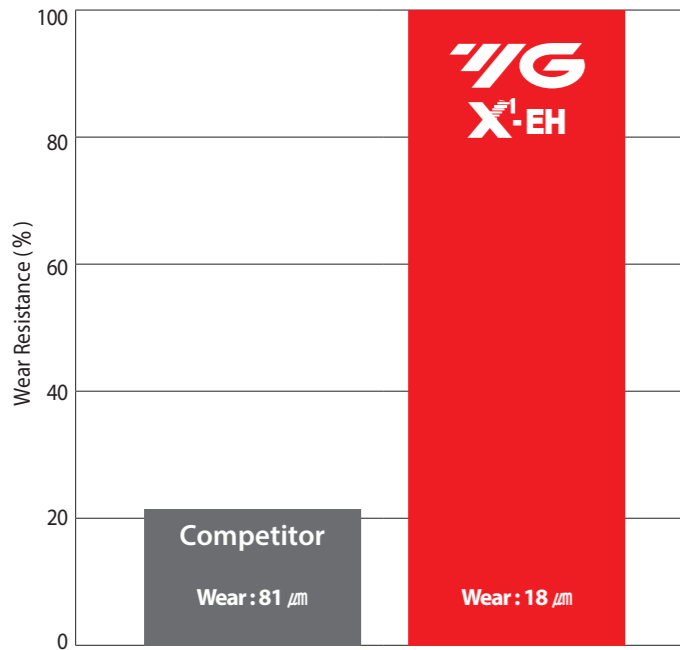
### GUIDE TO ICONS

CARBIDE	2	30°	35°	R +0.001 ~-0.005	R +0.003 ~-0.007	R ±0.005	PLAIN	C COATING	
The tool is made of Nanograin carbide	No. of Flutes	Helix Angle		Tolerance of Ball Radius	Tolerance of Corner Radius	Tolerance of Corner Radius	Type of Shank	Type of Coating	Cutting Conditions

## CASE STUDY

### TEST I Profiling application

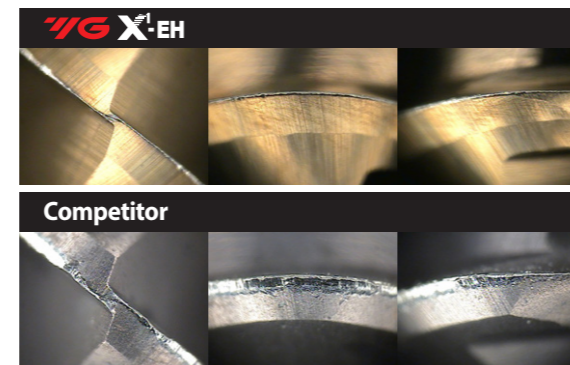
#### Ø3(R1.5) 2 Flute Ball Nose



#### Cutting Condition (Profiling)

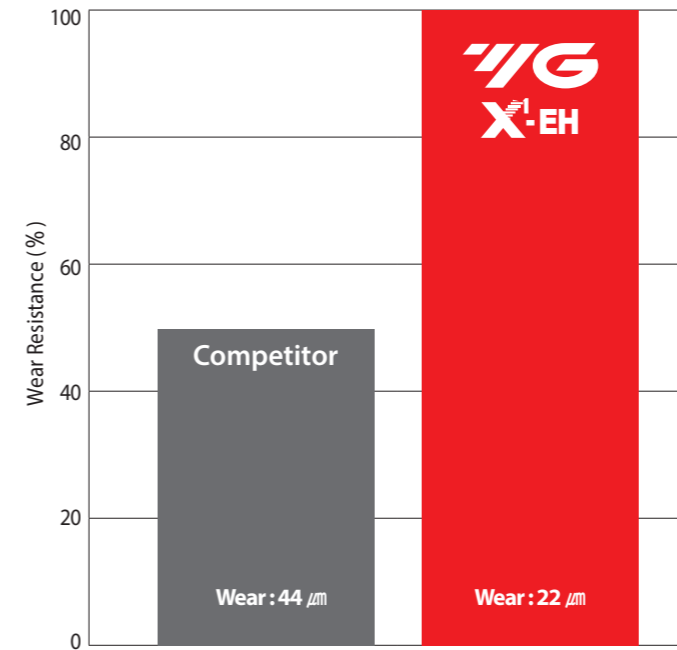
Tool	Ø3(R1.5) × Ø6 × 2.5(6) × 60
Work Material	- DIN : 1.2379 - JIS : SKD11(HRc63) - AISI : D2
R.P.M (rev./min.)	21,000 rev./min.
Feed (mm/min.)	2,800 mm/min.
Milling Depth (mm)	0.06mm (0.02xD) (Axial Depth) 0.15mm (0.05xD) (Radial Depth)
Coolant	Oil Mist
Machine	Machining Center

Total Milling Length : 248m



### TEST III Profiling application

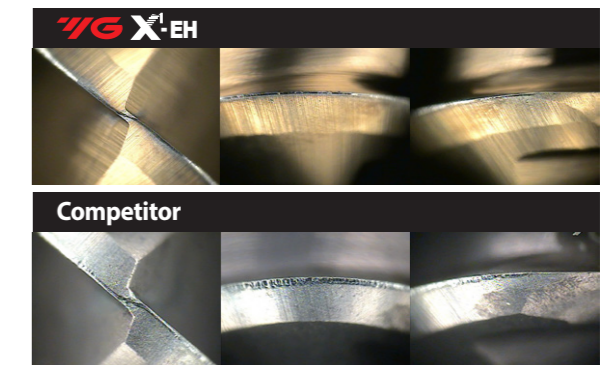
#### Ø3(R1.5) 2 Flute Ball Nose



#### Cutting Condition (Profiling)

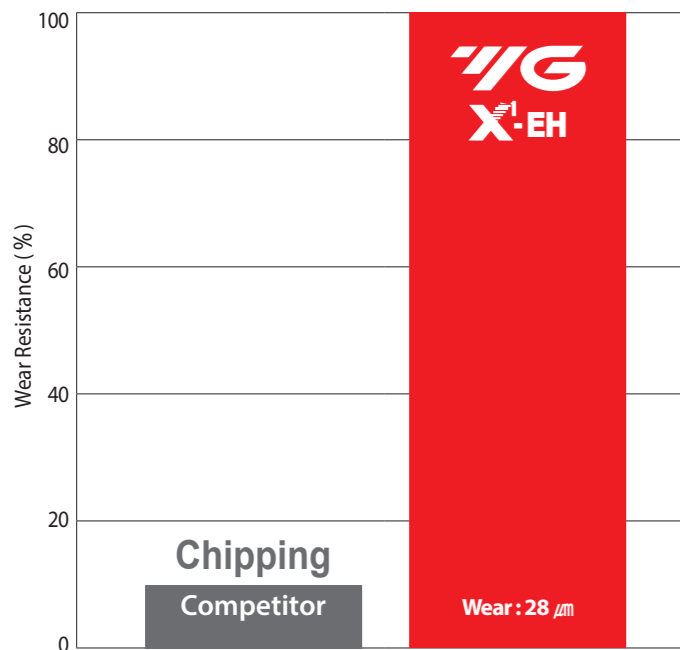
Tool	Ø3(R1.5) × Ø6 × 2.5(6) × 60
Work Material	- DIN : X30Cr13 - JIS : STAVAX(HRc52) - AISI : 420
R.P.M (rev./min.)	26,500 rev./min.
Feed (mm/min.)	4,000 mm/min.
Milling Depth (mm)	0.06mm (0.02xD) (Axial Depth) 0.15mm (0.05xD) (Radial Depth)
Coolant	Oil Mist
Machine	Machining Center

Total Milling length : 620m



### TEST II Side Cutting application

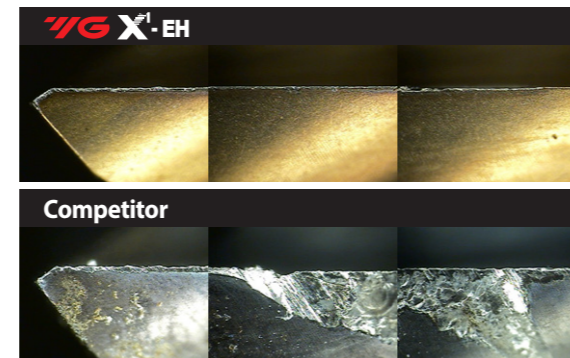
#### Ø6 2 Flute Square



#### Cutting Condition (Side Cutting)

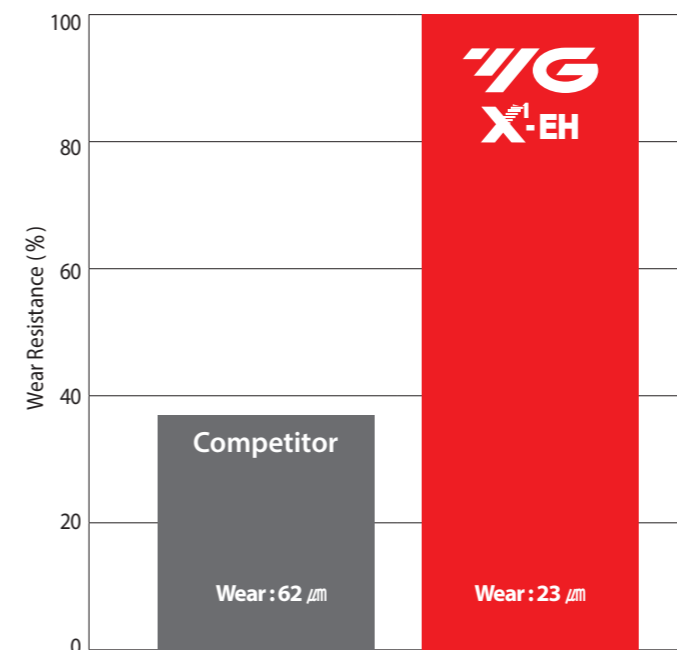
Tool	Ø6 × Ø6 × 15 × 50
Work Material	- DIN : 1.2379 - JIS : SKD11(HRc63) - AISI : D2
R.P.M (rev./min.)	4200 rev./min.
Feed (mm/min.)	255 mm/min.
Milling Depth (mm)	6mm (1.0xD) (Axial Depth) 0.18mm (0.03xD) (Radial Depth)
Coolant	Oil Mist
Machine	Machining Center

Total Milling Length : 2m



### TEST IV Face Milling application

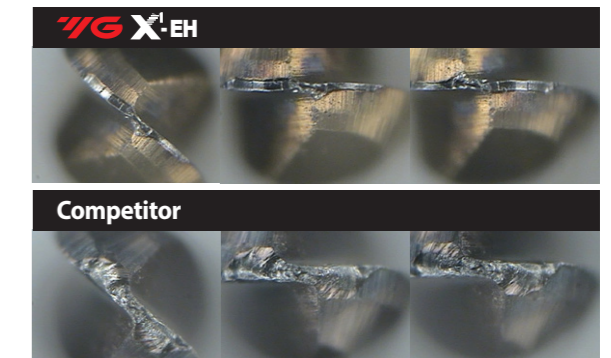
#### Ø0.6(R0.3) 2 Flute Ball Nose



#### Cutting Condition (Face Milling)

Tool	Ø0.6(R0.3) × Ø4 × 0.45(1) × 45
Work Material	- DIN : X30Cr13 - JIS : STAVAX(HRc52) - AISI : 420
R.P.M (rev./min.)	40,000 rev./min.
Feed (mm/min.)	1,400 mm/min.
Milling Depth (mm)	0.05mm (0.08xD) (Axial Depth) 0.1mm (0.16xD) (Radial Depth)
Coolant	Oil Mist
Machine	Machining Center

Total Milling length : 80m



SERIES	HPI90	HPI91	HPI92
FLUTE	2	2	2
HELIX ANGLE	30°	30°	30°
CUTTING EDGE SHAPE	BALL NOSE	BALL NOSE	BALL NOSE
SIZE MIN	R0.05	R0.05	R0.05
SIZE MAX	R10.0	R3.0	R6.0
PAGE	8	9	19

**C-COATED SOLID CARBIDE**



Please visit  
[globalyg1.com/mat](http://globalyg1.com/mat)  
for material search

Recommended cutting conditions : p41-62

◎ : Excellent ○ : Good

SERIES	HPI90	HPI91	HPI92
FLUTE	2	2	2
HELIX ANGLE	30°	30°	30°
CUTTING EDGE SHAPE	BALL NOSE	BALL NOSE	BALL NOSE
SIZE MIN	R0.05	R0.05	R0.05
SIZE MAX	R10.0	R3.0	R6.0
PAGE	8	9	19



ISO	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc	HPI90	HPI91	HPI92	
P	1	Non-alloy steel	About 0.15% C	Annealed	125				
	2		About 0.45% C	Annealed	190	13			
	3		About 0.45% C	Quenched & tempered	250	25			
	4		About 0.75% C	Annealed	270	28			
	5		About 0.75% C	Quenched & tempered	300	32	○	○	○
	6	Low alloy steel		Annealed	180	10			
	7		Quenched & tempered	275	29				
	8		Quenched & tempered	300	32	○	○	○	
	9		Quenched & tempered	350	38	○	○	○	
	10		Annealed	200	15				
	11.1	High alloyed steel, and tool steel	Quenched & Tempered	325	35	○	○	○	
	11.2		Quenched & Tempered	409	44	○	○	○	
M	12	Stainless steel	Ferritic / Martensitic	Annealed	200	15			
	13		Martensitic	Quenched & Tempered	240	23			
	14.1		Austenitic	180	10				
	14.2		PH Stainless Steel	180	10				
K	15	Grey cast iron	Pearlitic / ferritic	180	10				
	16		Pearlitic (Martensitic)	260	26				
	17	Nodular cast iron	Ferritic	160	3				
	18		Pearlitic	250	25				
	19	Malleable cast iron	Ferritic	130					
20	Pearlitic		230	21					
N	21	Aluminum-wrought alloy	Not Curable	60					
	22		Curable	Hardened	100				
	23	Aluminum-cast, alloyed	≤ 12% Si, Not Curable	75					
	24		≤ 12% Si, Curable	Hardened	90				
	25		> 12% Si, Not Curable	130					
	26	Copper and Copper Alloys (Bronze / Brass)	Cutting Alloys, PB>1%	110					
	27		CuZn, CuSnZn (Brass)	90					
	28		CuSn, lead-free copper and electrolytic copper	100					
	29.1	Non Metallic Materials	Duroplastic						
	29.2		GRAPHITE						
29.3	CFRP, GFRP								
30	Rubber, Wood, etc.								
S	31	Heat Resistant Super Alloys	Fe Based	Annealed	200	15			
	32		Cured	280	30				
	33		Annealed	250	25				
	34		Ni or Co Based	Cured	350	38			
	35	Cast	320	34					
	36	Titanium Alloys	Pure Titanium	400 Rm					
	37		Alpha + Beta Alloys	Hardened	1050 Rm				
H	38.1	Hardened steel		Hardened	421-469	45-49	◎	◎	◎
	38.2			Hardened	481-560	50-55	◎	◎	◎
	39.1			Hardened	577-654	56-60	◎	◎	◎
	39.2			Hardened	670-739	61-65	◎	◎	◎
	39.3			Hardened		66-70	◎	◎	◎
	40	Chilled Cast Iron	Cast	400	42	○	○	○	
41	Hardened Cast Iron	Hardened	550	55	◎	◎	◎		

SERIES	HPI89	HPI88
FLUTE	2	2
HELIX ANGLE	35°	35°
CORNER RADIUS	D0.2	SQUARE
SIZE MIN	D0.2	D0.1
SIZE MAX	D3.0	D6.0
PAGE	28	35



ISO	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc	HPI89	HPI88	
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	7		Quenched & tempered	275	29			
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	9		Quenched & tempered	350	38	○	○	
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	11.2		Quenched & Tempered	409	44	○	○	
M	12	Stainless steel	Ferritic / Martensitic	Annealed	200	15		
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	22		Curable	Hardened	100			
	23	Aluminum-cast, alloyed	≤ 12% Si, Not Curable	75				
	24		≤ 12% Si, Curable	Hardened	90			
	25		> 12% Si, Not Curable	130				
	26	Copper and Copper Alloys (Bronze / Brass)	Cutting Alloys, PB>1%	110				
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	29.2		GRAPHITE					
29.3	CFRP, GFRP							
30	Rubber, Wood, etc.							
S	31	Heat Resistant Super Alloys	Fe Based	Annealed	200	15		
	32		Cured	280	30			
	33		Annealed	250	25			
	34		Ni or Co Based	Cured	350	38		
	35	Cast	320	34				
	36	Titanium Alloys	Pure Titanium	400 Rm				
	37		Alpha + Beta Alloys	Hardened	1050 Rm			
H	38.1	Hardened steel		Hardened	421-469	45-49	◎	◎
	38.2			Hardened	481-560	50-55	◎	◎
	39.1			Hardened	577-654	56-60	◎	◎
	39.2			Hardened	670-739	61-65	◎	◎
	39.3			Hardened		66-70	◎	◎
	40	Chilled Cast Iron	Cast	400	42	○	○	
41	Hardened Cast Iron	Hardened	550	55	◎	◎		

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**DIE & MOLD**

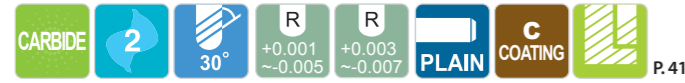
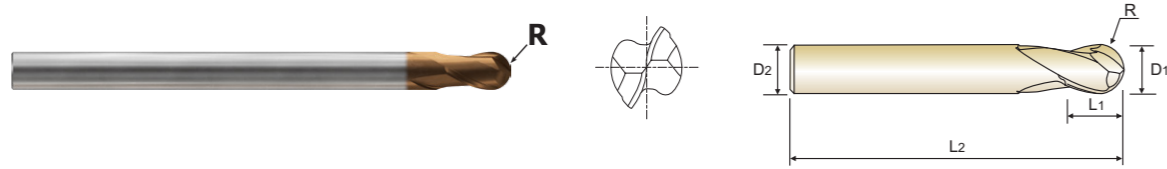


**C-COATED SOLID CARBIDE END MILLS  
2 FLUTE BALL NOSE**

SERIES

PLAIN SHANK **HPI90**

- ▶ Improvement of tool life by applying new coating
- ▶ Application of tight tolerances for precision machining



R0.05-R3 R4-R10

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Overall Length
	R	D <sub>1</sub>	D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>
HPI90001	R0.05	0.1	4	0.1	50
HPI900015	R0.075	0.15	4	0.15	50
HPI90002	R0.1	0.2	4	0.2	50
HPI90003	R0.15	0.3	4	0.3	50
HPI90004	R0.2	0.4	4	0.6	50
HPI90005	R0.25	0.5	4	0.8	50
HPI90006	R0.3	0.6	4	0.9	50
HPI90008	R0.4	0.8	4	1.2	50
HPI90010	R0.5	1.0	4	1.5	50
HPI90015	R0.75	1.5	4	2.3	50
HPI90020	R1.0	2.0	4	3	60
HPI90025	R1.25	2.5	6	3.8	60
HPI90030	R1.5	3.0	6	5	60
HPI90040	R2.0	4.0	4	6	70
HPI90901	R2.0	4.0	6	6	70
HPI90050	R2.5	5.0	6	8	70
HPI90060	R3.0	6.0	6	10	80
HPI90080	R4.0	8.0	8	12	100
HPI90100	R5.0	10.0	10	15	100
HPI90120	R6.0	12.0	12	18	110
HPI90160	R8.0	16.0	16	24	140
HPI90200	R10.0	20.0	20	30	160

Size	Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R3	+0.001~-0.005	0~-0.010	h4
over R3	+0.003~-0.007	0~-0.012	* Shank Dia.>ø6 : h5

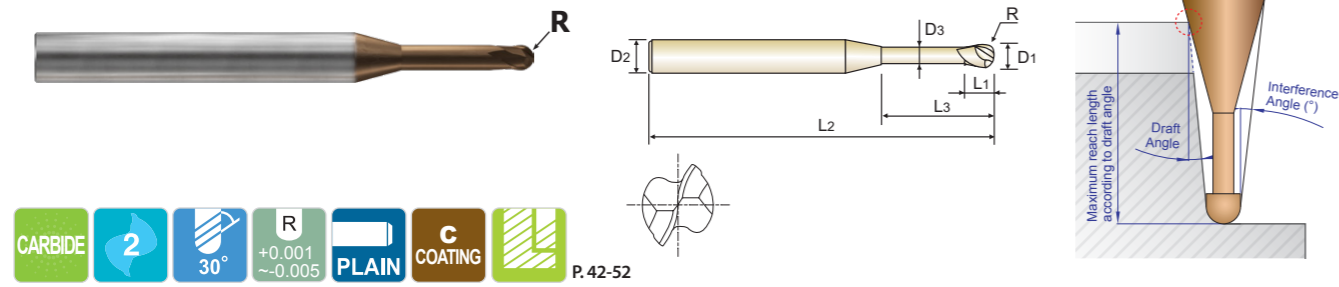
◎ : Excellent ○ : Good

ISO Material Description	P										M					K																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
	Non-alloy steel					Low alloy steel					High alloyed steel, and tool steel					Stainless steel					Grey cast iron					Nodular cast iron					Malleable cast iron																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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HRc	13	25	28	32	38	44	48	52	56	61	65	66-70	42	45	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158	160	162	164	166	168	170	172	174	176	178	180	182	184	186	188	190	192	194	196	198	200	202	204	206	208	210	212	214	216	218	220	222	224	226	228	230	232	234	236	238	240	242	244	246	248	250	252	254	256	258	260	262	264	266	268	270	272	274	276	278	280	282	284	286	288	290	292	294	296	298	300	302	304	306	308	310	312	314	316	318	320	322	324	326	328	330	332	334	336	338	340	342	344	346	348	350	352	354	356	358	360	362	364	366	368	370	372	374	376	378	380	382	384	386	388	390	392	394	396	398	400	402	404	406	408	410	412	414	416	418	420	422	424	426	428	430	432	434	436	438	440	442	444	446	448	450	452	454	456	458	460	462	464	466	468	470	472	474	476	478	480	482	484	486	488	490	492	494	496	498	500	502	504	506	508	510	512	514	516	518	520	522	524	526	528	530	532	534	536	538	540	542	544	546	548	550	552	554	556	558	560	562	564	566	568	570	572	574	576	578	580	582	584	586	588	590	592	594	596	598	600	602	604	606	608	610	612	614	616	618	620	622	624	626	628	630	632	634	636	638	640	642	644	646	648	650	652	654	656	658	660	662	664	666	668	670	672	674	676	678	680	682	684	686	688	690	692	694	696	698	700	702	704	706	708	710	712	714	716	718	720	722	724	726	728	730	732	734	736	738	740	742	744	746	748	750	752	754	756	758	760	762	764	766	768	770	772	774	776	778	780	782	784	786	788	790	792	794	796	798	800	802	804	806	808	810	812	814	816	818	820	822	824	826	828	830	832	834	836	838	840	842	844	846	848	850	852	854	856	858	860	862	864	866	868	870	872	874	876	878	880	882	884	886	888	890	892	894	896	898	900	902	904	906	908	910	912	914	916	918	920	922	924	926	928	930	932	934	936	938	940	942	944	946	948	950	952	954	956	958	960	962	964	966	968	970	972	974	976	978	980	982	984	986	988	990	992	994	996	998	1000	1002	1004	1006	1008	1010	1012	1014	1016	1018	1020	1022	1024	1026	1028	1030	1032	1034	1036	1038	1040	1042	1044	1046	1048	1050	1052	1054	1056	1058	1060	1062	1064	1066	1068	1070	1072	1074	1076	1078	1080	1082	1084	1086	1088	1090	1092	1094	1096	1098	1100	1102	1104	1106	1108	1110	1112	1114	1116	1118	1120	1122	1124	1126	1128	1130	1132	1134	1136	1138	1140	1142	1144	1146	1148	1150	1152	1154	1156	1158	1160	1162	1164	1166	1168	1170	1172	1174	1176	1178	1180	1182	1184	1186	1188	1190	1192	1194	1196	1198	1200	1202	1204	1206	1208	1210	1212	1214	1216	1218	1220	1222	1224	1226	1228	1230	1232	1234	1236	1238	1240	1242	1244	1246	1248	1250	1252	1254	1256	1258	1260	1262	1264	1266	1268	1270	1272	1274	1276	1278	1280	1282	1284	1286	1288	1290	1292	1294	1296	1298	1300	1302	1304	1306	1308	1310	1312	1314	1316	1318	1320	1322	1324	1326	1328	1330	1332	1334	1336	1338	1340	1342	1344	1346	1348	1350	1352	1354	1356	1358	1360	1362	1364	1366	1368	1370	1372	1374	1376	1378	1380	1382	1384	1386	1388	1390	1392	1394	1396	1398	1400	1402	1404	1406	1408	1410	1412	1414	1416	1418	1420	1422	1424	1426	1428	1430	1432	1434	1436	1438	1440	1442	1444	1446	1448	1450	1452	1454	1456	1458	1460	1462	1464	1466	1468	1470	1472	1474	1476	1478	1480	1482	1484	1486	1488	1490	1492	1494	1496	1498	1500	1502	1504	1506	1508	1510	1512	1514	1516	1518	1520	1522	1524	1526	1528	1530	1532	1534	1536	1538	1540	1542	1544	1546	1548	1550	1552	1554	1556	1558	1560	1562	1564	1566	1568	1570	1572	1574	1576	1578	1580	1582	1584	1586	1588	1590	1592	1594	1596	1598	1600	1602	1604	1606	1608	1610	1612	1614	1616	1618	1620	1622	1624	1626	1628	1630	1632	1634	1636	1638	1640	1642	1644	1646	1648	1650	1652	1654	1656	1658	1660	1662	1664	1666	1668	1670	1672	1674	1676	1678	1680	1682	1684	1686	1688	1690	1692	1694	1696	1698	1700	1702	1704	1706	1708	1710	1712	1714	1716	1718	1720	1722	1724	1726	1728	1730	1732	1734	1736	1738	1740	1742	1744	1746	1748	1750	1752	1754	1756	1758	1760	1762	1764	1766	1768	1770	1772	1774	1776	1778	1780	1782	1784	1786	1788	1790	1792	1794	1796	1798	1800	1802	1804	1806	1808	1810	1812	1814	1816	1818	1820	1822	1824	1826	1828	1830	1832	1834	1836	1838	1840	1842	1844	1846	1848	1850	1852	1854	1856	1858	1860	1862	1864	1866	1868	1870	1872	1874	1876	1878	1880	1882	1884	1886	1888	1890	1892	1894	1896	1898	1900	1902	1904	1906	1908	1910	1912	1914	1916	1918	1920	1922	1924	1926	1928	1930	1932	1934	1936	1938	1940	1942	1944	1946	1948	1950	1952	1954	1956	1958	1960	1962	1964	1966	1968	1970	1972	1974	1976	1978	1980	1982	1984	1986	1988	1990	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010	2012	2014	2016	2018	2020	2022	2024	2026	2028	2030	2032	2034	2036	2038	2040	2042	2044	2046	2048	2050	2052	2054	2056	2058	2060	2062	2064	2066	2068	2070	2072	2074	2076	2078	2080	2082	2084	2086	2088	2090	2092	2094	2096	2098	2100	2102	2104	2106	2108	2110	2112	2114	2116	2118	2120	2122	2124	2126	2128	2130	2132	2134	2136	2138	2140	2142	2144	2146	2148	2150	2152	2154	2156	2158	2160	2162	2164	2166	2168	2170	2172	2174	2176	2178	2180	2182	2184	2186	2188	2190	2192	2194	2196	2198	2200	2202	2204	2206	2208	2210	2212	2214	2216	2218	2220	2222	2224	2226	2228	2230	2232	2234	2236	2238	2240	2242	2244	2246	2248	2250	2252	2254	2256	2258	2260	2262	2264	2266	2268	2270	2272	227

C-COATED SOLID CARBIDE END MILLS  
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES  
PLAIN SHANK **HPI91**

- ▶ Improvement of tool life by applying new coating
- ▶ Application of tight tolerances for precision machining



Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
									0.5°	1°	1.5°	2°	3°
HPI91923	R0.15	0.3	4	0.2	1.75	45	0.27	12.19	1.92	2.02	2.13	2.25	2.55
HPI91924	R0.15	0.3	4	0.2	2	45	0.27	11.86	2.19	2.30	2.42	2.56	2.90
HPI91925	R0.15	0.3	4	0.2	2.25	45	0.27	11.54	2.45	2.58	2.72	2.87	3.26
HPI91926	R0.15	0.3	4	0.2	2.5	45	0.27	11.24	2.71	2.85	3.01	3.19	3.61
HPI91927	R0.15	0.3	4	0.2	3	45	0.27	10.68	3.24	3.41	3.60	3.81	4.33
HPI91928	R0.15	0.3	4	0.2	3.5	45	0.27	10.17	3.76	3.96	4.18	4.43	5.04
HPI91929	R0.15	0.3	4	0.2	4	45	0.27	9.71	4.29	4.52	4.77	5.06	5.75
HPI91930	R0.15	0.3	6	0.2	1.5	50	0.27	13.31	1.66	1.74	1.84	1.94	2.19
HPI91004	R0.2	0.4	4	0.3	0.5	45	0.37	14.28	0.61	0.63	0.65	0.68	0.75
HPI91931	R0.2	0.4	4	0.3	0.8	45	0.37	13.72	0.92	0.96	1.00	1.05	1.17
HPI91932	R0.2	0.4	4	0.3	1	45	0.37	13.37	1.13	1.18	1.24	1.30	1.46
HPI91933	R0.2	0.4	4	0.3	1.5	45	0.37	12.57	1.66	1.74	1.83	1.93	2.17
HPI91934	R0.2	0.4	4	0.3	2	45	0.37	11.86	2.18	2.29	2.41	2.55	2.88
HPI91935	R0.2	0.4	4	0.3	2.5	45	0.37	11.22	2.71	2.85	3.00	3.17	3.59
HPI91936	R0.2	0.4	4	0.3	3	45	0.37	10.65	3.24	3.40	3.59	3.80	4.31
HPI91937	R0.2	0.4	4	0.3	3.5	45	0.37	10.13	3.76	3.96	4.18	4.42	5.02
HPI91938	R0.2	0.4	4	0.3	4	45	0.37	9.66	4.29	4.51	4.76	5.04	5.73
HPI91939	R0.2	0.4	4	0.3	4.5	45	0.37	9.23	4.81	5.07	5.35	5.67	6.44
HPI91940	R0.2	0.4	4	0.3	5	45	0.37	8.84	5.34	5.62	5.94	6.29	7.15
HPI91941	R0.2	0.4	4	0.3	6	45	0.37	8.15	6.39	6.73	7.11	7.54	8.57
HPI91942	R0.2	0.4	4	0.4	1	35	0.37	13.37	1.13	1.18	1.24	1.30	1.46
HPI91943	R0.2	0.4	4	0.4	1	50	0.37	13.37	1.13	1.18	1.24	1.30	1.46
HPI91944	R0.2	0.4	6	0.3	1	50	0.37	13.91	1.13	1.18	1.24	1.30	1.46
HPI91945	R0.2	0.4	6	0.3	2	50	0.37	12.82	2.18	2.29	2.41	2.55	2.88
HPI91946	R0.2	0.4	6	0.4	1	50	0.37	13.91	1.13	1.18	1.24	1.30	1.46
HPI91005	R0.25	0.5	4	0.35	1	45	0.45	13.35	1.19	1.24	1.30	1.36	1.52

Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
+0.001~-0.005	0~-0.010	h4

NEXT PAGE ▶

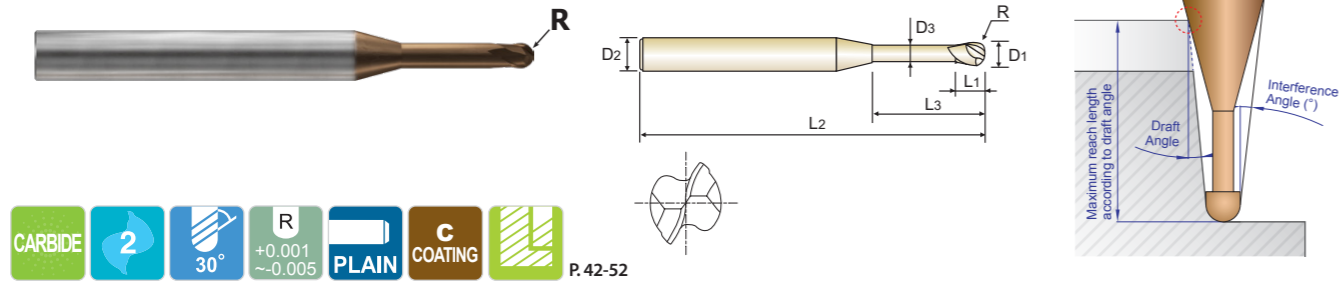
◎ : Excellent ○ : Good

ISO Material Description	P										M					K																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	Non-alloy steel					Low alloy steel					High alloyed steel, and tool steel					Stainless steel					Grey cast iron					Nodular cast iron					Malleable cast iron																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
HRC	13	25	28	32	38	44	48	52	58	63	68	73	78	83	88	93	98	103	108	113	118	123	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198	203	208	213	218	223	228	233	238	243	248	253	258	263	268	273	278	283	288	293	298	303	308	313	318	323	328	333	338	343	348	353	358	363	368	373	378	383	388	393	398	403	408	413	418	423	428	433	438	443	448	453	458	463	468	473	478	483	488	493	498	503	508	513	518	523	528	533	538	543	548	553	558	563	568	573	578	583	588	593	598	603	608	613	618	623	628	633	638	643	648	653	658	663	668	673	678	683	688	693	698	703	708	713	718	723	728	733	738	743	748	753	758	763	768	773	778	783	788	793	798	803	808	813	818	823	828	833	838	843	848	853	858	863	868	873	878	883	888	893	898	903	908	913	918	923	928	933	938	943	948	953	958	963	968	973	978	983	988	993	998	1003	1008	1013	1018	1023	1028	1033	1038	1043	1048	1053	1058	1063	1068	1073	1078	1083	1088	1093	1098	1103	1108	1113	1118	1123	1128	1133	1138	1143	1148	1153	1158	1163	1168	1173	1178	1183	1188	1193	1198	1203	1208	1213	1218	1223	1228	1233	1238	1243	1248	1253	1258	1263	1268	1273	1278	1283	1288	1293	1298	1303	1308	1313	1318	1323	1328	1333	1338	1343	1348	1353	1358	1363	1368	1373	1378	1383	1388	1393	1398	1403	1408	1413	1418	1423	1428	1433	1438	1443	1448	1453	1458	1463	1468	1473	1478	1483	1488	1493	1498	1503	1508	1513	1518	1523	1528	1533	1538	1543	1548	1553	1558	1563	1568	1573	1578	1583	1588	1593	1598	1603	1608	1613	1618	1623	1628	1633	1638	1643	1648	1653	1658	1663	1668	1673	1678	1683	1688	1693	1698	1703	1708	1713	1718	1723	1728	1733	1738	1743	1748	1753	1758	1763	1768	1773	1778	1783	1788	1793	1798	1803	1808	1813	1818	1823	1828	1833	1838	1843	1848	1853	1858	1863	1868	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973	1978	1983	1988	1993	1998	2003	2008	2013	2018	2023	2028	2033	2038	2043	2048	2053	2058	2063	2068	2073	2078	2083	2088	2093	2098	2103	2108	2113	2118	2123	2128	2133	2138	2143	2148	2153	2158	2163	2168	2173	2178	2183	2188	2193	2198	2203	2208	2213	2218	2223	2228	2233	2238	2243	2248	2253	2258	2263	2268	2273	2278	2283	2288	2293	2298	2303	2308	2313	2318	2323	2328	2333	2338	2343	2348	2353	2358	2363	2368	2373	2378	2383	2388	2393	2398	2403	2408	2413	2418	2423	2428	2433	2438	2443	2448	2453	2458	2463	2468	2473	2478	2483	2488	2493	2498	2503	2508	2513	2518	2523	2528	2533	2538	2543	2548	2553	2558	2563	2568	2573	2578	2583	2588	2593	2598	2603	2608	2613	2618	2623	2628	2633	2638	2643	2648	2653	2658	2663	2668	2673	2678	2683	2688	2693	2698	2703	2708	2713	2718	2723	2728	2733	2738	2743	2748	2753	2758	2763	2768	2773	2778	2783	2788	2793	2798	2803	2808	2813	2818	2823	2828	2833	2838	2843	2848	2853	2858	2863	2868	2873	2878	2883	2888	2893	2898	2903	2908	2913	2918	2923	2928	2933	2938	2943	2948	2953	2958	2963	2968	2973	2978	2983	2988	2993	2998	3003	3008	3013	3018	3023	3028	3033	3038	3043	3048	3053	3058	3063	3068	3073	3078	3083	3088	3093	3098	3103	3108	3113	3118	3123	3128	3133	3138	3143	3148	3153	3158	3163	3168	3173	3178	3183	3188	3193	3198	3203	3208	3213	3218	3223	3228	3233	3238	3243	3248	3253	3258	3263	3268	3273	3278	3283	3288	3293	3298	3303	3308	3313	3318	3323	3328	3333	3338	3343	3348	3353	3358	3363	3368	3373	3378	3383	3388	3393	3398	3403	3408	3413	3418	3423	3428	3433	3438	3443	3448	3453	3458	3463	3468	3473	3478	3483	3488	3493	3498	3503	3508	3513	3518	3523	3528	3533	3538	3543	3548	3553	3558	3563	3568	3573	3578	3583	3588	3593	3598	3603	3608	3613	3618	3623	3628	3633	3638	3643	3648	3653	3658	3663	3668	3673	3678	3683	3688	3693	3698	3703	3708	3713	3718	3723	3728	3733	3738	3743	3748	3753	3758	3763	3768	3773	3778	3783	3788	3793	3798	3803	3808	3813	3818	3823	3828	3833	3838	3843	3848	3853	3858	3863	3868	3873	3878	3883	3888	3893	3898	3903	3908	3913	3918	3923	3928	3933	3938	3943	3948	3953	3958	3963	3968	3973	3978	3983	3988	3993	3998	4003	4008	4013	4018	4023	4028	4033	4038	4043	4048	4053	4058	4063	4068	4073	4078	4083	4088	4093	4098	4103	4108	4113	4118	4123	4128	4133	4138	4143	4148	4153	4158	4163	4168	4173	4178	4183	4188	4193	4198	4203	4208	4213	4218	4223	4228	4233	4238	4243	4248	4253	4258	4263	4268	4273	4278	4283	4288	4293	4298	4303	4308	4313	4318	4323	4328	4333	4338	4343	4348	4353	4358	4363	4368	4373	4378	4383	4388	4393	4398	4403	4408	4413	4418

C-COATED SOLID CARBIDE END MILLS  
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES  
PLAIN SHANK **HPI91**

- ▶ Improvement of tool life by applying new coating
- ▶ Application of tight tolerances for precision machining



Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
									0.5°	1°	1.5°	2°	3°
HPI91972	R0.3	0.6	4	0.45	8	45	0.55	6.86	8.55	9.00	9.51	10.08	11.36
HPI91973	R0.3	0.6	4	0.45	9	45	0.55	6.41	9.60	10.11	10.68	11.33	12.53
HPI91974	R0.3	0.6	4	0.45	10	45	0.55	6.01	10.65	11.22	11.86	12.57	13.70
HPI91975	R0.3	0.6	4	0.45	12	45	0.55	5.35	12.76	13.44	14.21	15.07	16.03
HPI91976	R0.3	0.6	4	0.6	1.5	35	0.55	12.55	1.71	1.79	1.88	1.97	2.21
HPI91977	R0.3	0.6	4	0.6	1.5	50	0.55	12.55	1.71	1.79	1.88	1.97	2.21
HPI91978	R0.3	0.6	6	0.45	2	50	0.55	12.81	2.24	2.34	2.46	2.60	2.92
HPI91979	R0.3	0.6	6	0.45	3	50	0.55	11.85	3.29	3.45	3.64	3.84	4.34
HPI91980	R0.3	0.6	6	0.45	4	50	0.55	11.02	4.34	4.56	4.81	5.09	5.77
HPI91981	R0.3	0.6	6	0.6	1.5	50	0.55	13.36	1.71	1.79	1.88	1.97	2.21
HPI91007	R0.35	0.7	4	0.5	2	45	0.65	11.80	2.24	2.34	2.45	2.58	2.90
HPI91982	R0.35	0.7	4	0.5	4	45	0.65	9.46	4.34	4.56	4.80	5.08	5.75
HPI91983	R0.35	0.7	4	0.5	6	45	0.65	7.89	6.44	6.78	7.15	7.57	8.59
HPI91984	R0.35	0.7	4	0.5	8	45	0.65	6.77	8.55	9.00	9.50	10.07	11.29
HPI91008	R0.4	0.8	4	0.6	2	45	0.75	11.79	2.23	2.33	2.45	2.57	2.88
HPI91985	R0.4	0.8	4	0.6	3	45	0.75	10.46	3.28	3.44	3.62	3.82	4.30
HPI91986	R0.4	0.8	4	0.6	4	45	0.75	9.40	4.34	4.55	4.79	5.07	5.72
HPI91987	R0.4	0.8	4	0.6	5	45	0.75	8.53	5.39	5.66	5.97	6.31	7.15
HPI91988	R0.4	0.8	4	0.6	6	45	0.75	7.81	6.44	6.77	7.14	7.56	8.57
HPI91989	R0.4	0.8	4	0.6	7	45	0.75	7.20	7.49	7.88	8.32	8.81	9.99
HPI91990	R0.4	0.8	4	0.6	8	45	0.75	6.68	8.54	8.99	9.49	10.05	11.23
HPI91991	R0.4	0.8	4	0.6	10	45	0.75	5.83	10.65	11.21	11.84	12.55	13.56
HPI91992	R0.4	0.8	4	0.6	12	45	0.75	5.18	12.75	13.43	14.19	15.04	15.90
HPI91993	R0.4	0.8	4	0.8	2	35	0.75	11.79	2.23	2.33	2.45	2.57	2.88
HPI91994	R0.4	0.8	4	0.8	2	50	0.75	11.79	2.23	2.33	2.45	2.57	2.88
HPI91995	R0.4	0.8	6	0.6	2	50	0.75	12.85	2.23	2.33	2.45	2.57	2.88

Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
+0.001~-0.005	0~-0.010	h4

NEXT PAGE ▶

◎ : Excellent ○ : Good

ISO Material Description	P										M					K																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	Non-alloy steel					Low alloy steel					High alloyed steel, and tool steel					Stainless steel					Grey cast iron					Nodular cast iron					Malleable cast iron																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
HRC	13	25	28	32	38	44	48	52	58	63	68	73	78	83	88	93	98	103	108	113	118	123	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198	203	208	213	218	223	228	233	238	243	248	253	258	263	268	273	278	283	288	293	298	303	308	313	318	323	328	333	338	343	348	353	358	363	368	373	378	383	388	393	398	403	408	413	418	423	428	433	438	443	448	453	458	463	468	473	478	483	488	493	498	503	508	513	518	523	528	533	538	543	548	553	558	563	568	573	578	583	588	593	598	603	608	613	618	623	628	633	638	643	648	653	658	663	668	673	678	683	688	693	698	703	708	713	718	723	728	733	738	743	748	753	758	763	768	773	778	783	788	793	798	803	808	813	818	823	828	833	838	843	848	853	858	863	868	873	878	883	888	893	898	903	908	913	918	923	928	933	938	943	948	953	958	963	968	973	978	983	988	993	998	1003	1008	1013	1018	1023	1028	1033	1038	1043	1048	1053	1058	1063	1068	1073	1078	1083	1088	1093	1098	1103	1108	1113	1118	1123	1128	1133	1138	1143	1148	1153	1158	1163	1168	1173	1178	1183	1188	1193	1198	1203	1208	1213	1218	1223	1228	1233	1238	1243	1248	1253	1258	1263	1268	1273	1278	1283	1288	1293	1298	1303	1308	1313	1318	1323	1328	1333	1338	1343	1348	1353	1358	1363	1368	1373	1378	1383	1388	1393	1398	1403	1408	1413	1418	1423	1428	1433	1438	1443	1448	1453	1458	1463	1468	1473	1478	1483	1488	1493	1498	1503	1508	1513	1518	1523	1528	1533	1538	1543	1548	1553	1558	1563	1568	1573	1578	1583	1588	1593	1598	1603	1608	1613	1618	1623	1628	1633	1638	1643	1648	1653	1658	1663	1668	1673	1678	1683	1688	1693	1698	1703	1708	1713	1718	1723	1728	1733	1738	1743	1748	1753	1758	1763	1768	1773	1778	1783	1788	1793	1798	1803	1808	1813	1818	1823	1828	1833	1838	1843	1848	1853	1858	1863	1868	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973	1978	1983	1988	1993	1998	2003	2008	2013	2018	2023	2028	2033	2038	2043	2048	2053	2058	2063	2068	2073	2078	2083	2088	2093	2098	2103	2108	2113	2118	2123	2128	2133	2138	2143	2148	2153	2158	2163	2168	2173	2178	2183	2188	2193	2198	2203	2208	2213	2218	2223	2228	2233	2238	2243	2248	2253	2258	2263	2268	2273	2278	2283	2288	2293	2298	2303	2308	2313	2318	2323	2328	2333	2338	2343	2348	2353	2358	2363	2368	2373	2378	2383	2388	2393	2398	2403	2408	2413	2418	2423	2428	2433	2438	2443	2448	2453	2458	2463	2468	2473	2478	2483	2488	2493	2498	2503	2508	2513	2518	2523	2528	2533	2538	2543	2548	2553	2558	2563	2568	2573	2578	2583	2588	2593	2598	2603	2608	2613	2618	2623	2628	2633	2638	2643	2648	2653	2658	2663	2668	2673	2678	2683	2688	2693	2698	2703	2708	2713	2718	2723	2728	2733	2738	2743	2748	2753	2758	2763	2768	2773	2778	2783	2788	2793	2798	2803	2808	2813	2818	2823	2828	2833	2838	2843	2848	2853	2858	2863	2868	2873	2878	2883	2888	2893	2898	2903	2908	2913	2918	2923	2928	2933	2938	2943	2948	2953	2958	2963	2968	2973	2978	2983	2988	2993	2998	3003	3008	3013	3018	3023	3028	3033	3038	3043	3048	3053	3058	3063	3068	3073	3078	3083	3088	3093	3098	3103	3108	3113	3118	3123	3128	3133	3138	3143	3148	3153	3158	3163	3168	3173	3178	3183	3188	3193	3198	3203	3208	3213	3218	3223	3228	3233	3238	3243	3248	3253	3258	3263	3268	3273	3278	3283	3288	3293	3298	3303	3308	3313	3318	3323	3328	3333	3338	3343	3348	3353	3358	3363	3368	3373	3378	3383	3388	3393	3398	3403	3408	3413	3418	3423	3428	3433	3438	3443	3448	3453	3458	3463	3468	3473	3478	3483	3488	3493	3498	3503	3508	3513	3518	3523	3528	3533	3538	3543	3548	3553	3558	3563	3568	3573	3578	3583	3588	3593	3598	3603	3608	3613	3618	3623	3628	3633	3638	3643	3648	3653	3658	3663	3668	3673	3678	3683	3688	3693	3698	3703	3708	3713	3718	3723	3728	3733	3738	3743	3748	3753	3758	3763	3768	3773	3778	3783	3788	3793	3798	3803	3808	3813	3818	3823	3828	3833	3838	3843	3848	3853	3858	3863	3868	3873	3878	3883	3888	3893	3898	3903	3908	3913	3918	3923	3928	3933	3938	3943	3948	3953	3958	3963	3968	3973	3978	3983	3988	3993	3998	4003	4008	4013	4018	4023	4028	4033	4038	4043	4048	4053	4058	4063	4068	4073	4078	4083	4088	4093	4098	4103	4108	4113	4118	4123	4128	4133	4138	4143	4148	4153	4158	4163	4168	4173	4178	4183	4188	4193	4198	4203	4208	4213	4218	4223	4228	4233	4238	4243	4248	4253	4258	4263	4268	4273	4278	4283	4288	4293	4298	4303	4308	4313	4318	4323	4328	4333	4338	4343	4348	4353	4358	4363	4368	4373	4378	4383	4388	4393	4398	4403	4408	4413



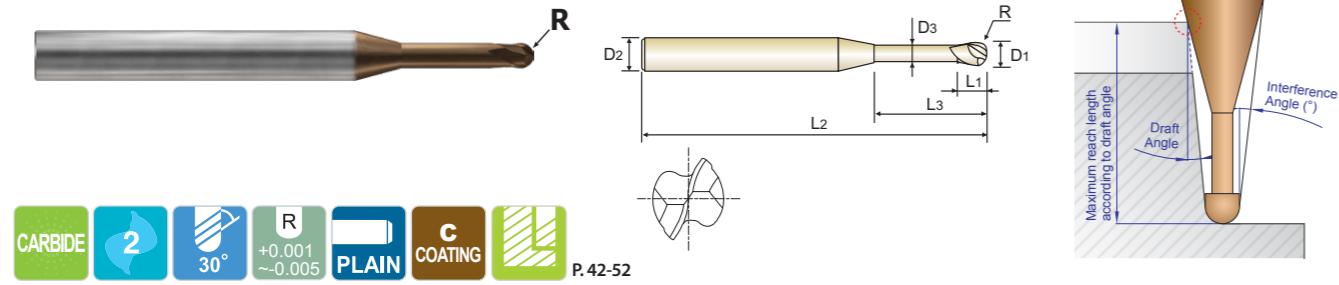


C-COATED SOLID CARBIDE END MILLS  
2 FLUTE BALL NOSE for RIB PROCESSING

SERIES

PLAIN SHANK **HPI91**

- ▶ Improvement of tool life by applying new coating
- ▶ Application of tight tolerances for precision machining



Unit : mm

EDP No.	Radius of Ball Nose R	Mill Diameter D1	Shank Diameter D2	Length of Cut L1	Length Below Shank L3	Overall Length L2	Neck Diameter D3	Interference Angle (°)	Maximum reach lengths according to draft angle				
									0.5°	1°	1.5°	2°	3°
HPI91868	R1.0	2.0	4	1.5	30	70	1.95	1.74	31.07	32.12	33.24	-	-
HPI91869	R1.0	2.0	4	1.5	35	70	1.95	1.51	36.24	37.47	38.79	-	-
HPI91870	R1.0	2.0	4	1.5	40	90	1.95	1.34	41.41	42.82	-	-	-
HPI91871	R1.0	2.0	4	2	5	40	1.95	7.28	5.23	5.38	5.54	5.71	6.09
HPI91872	R1.0	2.0	4	2	5	50	1.95	7.28	5.23	5.38	5.54	5.71	6.09
HPI91873	R1.0	2.0	6	1.5	4	50	1.95	10.73	4.20	4.31	4.43	4.56	4.85
HPI91874	R1.0	2.0	6	1.5	6	50	1.95	9.05	6.26	6.45	6.64	6.86	7.33
HPI91875	R1.0	2.0	6	1.5	8	50	1.95	7.82	8.33	8.59	8.86	9.16	9.82
HPI91876	R1.0	2.0	6	1.5	10	50	1.95	6.89	10.40	10.73	11.08	11.46	12.30
HPI91877	R1.0	2.0	6	1.5	16	60	1.95	5.07	16.60	17.15	17.73	18.36	19.76
HPI91878	R1.0	2.0	6	1.5	25	65	1.95	3.63	25.90	26.77	27.70	28.70	30.95
HPI91879	R1.0	2.0	6	2	5	50	1.95	9.82	5.23	5.38	5.54	5.71	6.09
HPI91025	R1.25	2.5	4	2.3	6	45	2.4	5.54	6.35	6.53	6.72	6.93	7.39
HPI91880	R1.25	2.5	4	2.3	8	45	2.4	4.41	8.42	8.67	8.94	9.23	9.87
HPI91881	R1.25	2.5	4	2.3	10	45	2.4	3.66	10.49	10.81	11.15	11.53	12.36
HPI91882	R1.25	2.5	4	2.3	15	50	2.4	2.57	15.66	16.16	16.70	17.28	-
HPI91883	R1.25	2.5	4	2.3	20	55	2.4	1.98	20.82	21.51	22.24	-	-
HPI91884	R1.25	2.5	4	2.3	25	65	2.4	1.61	25.99	26.85	27.78	-	-
HPI91885	R1.25	2.5	4	2.3	30	70	2.4	1.35	31.16	32.20	-	-	-
HPI91886	R1.25	2.5	4	2.3	35	70	2.4	1.17	36.33	37.55	-	-	-
HPI91030	R1.5	3.0	4	3	8	40	2.85	3.31	8.51	8.75	9.01	9.30	9.93
HPI91887	R1.5	3.0	6	2.5	6	60	2.85	8.22	6.44	6.61	6.80	7.00	7.44
HPI91888	R1.5	3.0	6	2.5	8	60	2.85	6.91	8.51	8.75	9.01	9.30	9.93
HPI91889	R1.5	3.0	6	2.5	10	60	2.85	5.96	10.58	10.89	11.23	11.60	12.41
HPI91890	R1.5	3.0	6	2.5	12	60	2.85	5.23	12.64	13.03	13.45	13.90	14.90
HPI91891	R1.5	3.0	6	2.5	14	60	2.85	4.67	14.71	15.17	15.66	16.20	17.39

NEXT PAGE ▶

Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
+0.001~-0.005	0~-0.010	h4

◎ : Excellent ○ : Good

ISO Material Description	P										M					K																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
	Non-alloy steel					Low alloy steel					High alloyed steel, and tool steel					Stainless steel					Grey cast iron					Nodular cast iron					Malleable cast iron																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
HRC	13	25	28	32	38	44	45	48	52	58	63	68	73	78	83	88	93	98	103	108	113	118	123	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198	203	208	213	218	223	228	233	238	243	248	253	258	263	268	273	278	283	288	293	298	303	308	313	318	323	328	333	338	343	348	353	358	363	368	373	378	383	388	393	398	403	408	413	418	423	428	433	438	443	448	453	458	463	468	473	478	483	488	493	498	503	508	513	518	523	528	533	538	543	548	553	558	563	568	573	578	583	588	593	598	603	608	613	618	623	628	633	638	643	648	653	658	663	668	673	678	683	688	693	698	703	708	713	718	723	728	733	738	743	748	753	758	763	768	773	778	783	788	793	798	803	808	813	818	823	828	833	838	843	848	853	858	863	868	873	878	883	888	893	898	903	908	913	918	923	928	933	938	943	948	953	958	963	968	973	978	983	988	993	998	1003	1008	1013	1018	1023	1028	1033	1038	1043	1048	1053	1058	1063	1068	1073	1078	1083	1088	1093	1098	1103	1108	1113	1118	1123	1128	1133	1138	1143	1148	1153	1158	1163	1168	1173	1178	1183	1188	1193	1198	1203	1208	1213	1218	1223	1228	1233	1238	1243	1248	1253	1258	1263	1268	1273	1278	1283	1288	1293	1298	1303	1308	1313	1318	1323	1328	1333	1338	1343	1348	1353	1358	1363	1368	1373	1378	1383	1388	1393	1398	1403	1408	1413	1418	1423	1428	1433	1438	1443	1448	1453	1458	1463	1468	1473	1478	1483	1488	1493	1498	1503	1508	1513	1518	1523	1528	1533	1538	1543	1548	1553	1558	1563	1568	1573	1578	1583	1588	1593	1598	1603	1608	1613	1618	1623	1628	1633	1638	1643	1648	1653	1658	1663	1668	1673	1678	1683	1688	1693	1698	1703	1708	1713	1718	1723	1728	1733	1738	1743	1748	1753	1758	1763	1768	1773	1778	1783	1788	1793	1798	1803	1808	1813	1818	1823	1828	1833	1838	1843	1848	1853	1858	1863	1868	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973	1978	1983	1988	1993	1998	2003	2008	2013	2018	2023	2028	2033	2038	2043	2048	2053	2058	2063	2068	2073	2078	2083	2088	2093	2098	2103	2108	2113	2118	2123	2128	2133	2138	2143	2148	2153	2158	2163	2168	2173	2178	2183	2188	2193	2198	2203	2208	2213	2218	2223	2228	2233	2238	2243	2248	2253	2258	2263	2268	2273	2278	2283	2288	2293	2298	2303	2308	2313	2318	2323	2328	2333	2338	2343	2348	2353	2358	2363	2368	2373	2378	2383	2388	2393	2398	2403	2408	2413	2418	2423	2428	2433	2438	2443	2448	2453	2458	2463	2468	2473	2478	2483	2488	2493	2498	2503	2508	2513	2518	2523	2528	2533	2538	2543	2548	2553	2558	2563	2568	2573	2578	2583	2588	2593	2598	2603	2608	2613	2618	2623	2628	2633	2638	2643	2648	2653	2658	2663	2668	2673	2678	2683	2688	2693	2698	2703	2708	2713	2718	2723	2728	2733	2738	2743	2748	2753	2758	2763	2768	2773	2778	2783	2788	2793	2798	2803	2808	2813	2818	2823	2828	2833	2838	2843	2848	2853	2858	2863	2868	2873	2878	2883	2888	2893	2898	2903	2908	2913	2918	2923	2928	2933	2938	2943	2948	2953	2958	2963	2968	2973	2978	2983	2988	2993	2998	3003	3008	3013	3018	3023	3028	3033	3038	3043	3048	3053	3058	3063	3068	3073	3078	3083	3088	3093	3098	3103	3108	3113	3118	3123	3128	3133	3138	3143	3148	3153	3158	3163	3168	3173	3178	3183	3188	3193	3198	3203	3208	3213	3218	3223	3228	3233	3238	3243	3248	3253	3258	3263	3268	3273	3278	3283	3288	3293	3298	3303	3308	3313	3318	3323	3328	3333	3338	3343	3348	3353	3358	3363	3368	3373	3378	3383	3388	3393	3398	3403	3408	3413	3418	3423	3428	3433	3438	3443	3448	3453	3458	3463	3468	3473	3478	3483	3488	3493	3498	3503	3508	3513	3518	3523	3528	3533	3538	3543	3548	3553	3558	3563	3568	3573	3578	3583	3588	3593	3598	3603	3608	3613	3618	3623	3628	3633	3638	3643	3648	3653	3658	3663	3668	3673	3678	3683	3688	3693	3698	3703	3708	3713	3718	3723	3728	3733	3738	3743	3748	3753	3758	3763	3768	3773	3778	3783	3788	3793	3798	3803	3808	3813	3818	3823	3828	3833	3838	3843	3848	3853	3858	3863	3868	3873	3878	3883	3888	3893	3898	3903	3908	3913	3918	3923	3928	3933	3938	3943	3948	3953	3958	3963	3968	3973	3978	3983	3988	3993	3998	4003	4008	4013	4018	4023	4028	4033	4038	4043	4048	4053	4058	4063	4068	4073	4078	4083	4088	4093	4098	4103	4108	4113	4118	4123	4128	4133	4138	4143	4148	4153	4158	4163	4168	4173	4178	4183	4188	4193	4198	4203	4208	4213	4218	4223	4228	4233	4238	4243	4248	4253	4258	4263	4268	4273	4278	4283	4288	4293	4298	4303	4308	4313	4318	4323	4328	4333	4338	4343	4348	4353	4358	4363	4368	4373	4378	4383	4388	4393	4





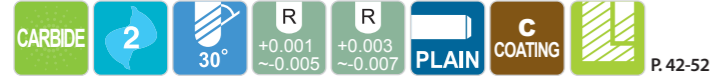
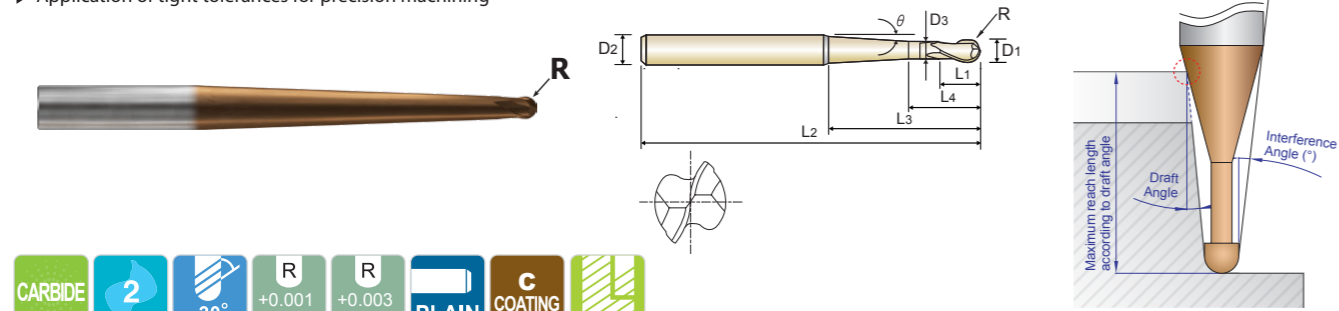


**C-COATED SOLID CARBIDE END MILLS**  
**2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK**

SERIES

PLAIN SHANK **HPI92**

- ▶ Improvement of tool life by applying new coating
- ▶ Application of tight tolerances for precision machining



R0.05-R3 R3.5-R6 Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Neck Taper Angle(°)	Under Neck Parallel Length	Interference Angle (°)	Maximum reach lengths according to draft angle				
											0.5°	1°	1.5°	2°	3°
HPI92020	R1.0	2.0	4	1.5	12	60	1.95	0.5°	3.5	3.93	12.18	12.57	12.99	13.44	14.45
HPI92821	R1.0	2.0	4	1.5	12	60	1.95	1°	3.5	4.01	8.86	12.27	12.68	13.12	14.10
HPI92822	R1.0	2.0	4	1.5	12	60	1.95	1.5°	3.5	4.09	6.18	11.36	12.37	12.80	13.76
HPI92823	R1.0	2.0	4	1.5	12	60	1.95	2°	3.5	4.17	5.29	7.43	12.07	12.48	13.41
HPI92824	R1.0	2.0	4	1.5	16	60	1.95	0.5°	3.5	3.11	16.18	16.71	17.28	17.89	19.26
HPI92825	R1.0	2.0	4	1.5	16	60	1.95	1°	3.5	3.18	8.86	16.27	16.83	17.42	18.75
HPI92826	R1.0	2.0	4	1.5	16	60	1.95	1.5°	3.5	3.25	6.18	11.36	16.37	16.95	18.24
HPI92827	R1.0	2.0	4	1.5	16	60	1.95	2°	3.5	3.33	5.29	7.43	13.86	16.48	17.74
HPI92828	R1.0	2.0	4	1.5	20	70	1.95	0.5°	3.5	2.57	20.18	20.85	21.57	22.34	-
HPI92829	R1.0	2.0	4	1.5	20	70	1.95	1°	3.5	2.63	8.86	20.27	20.97	21.72	-
HPI92830	R1.0	2.0	4	1.5	20	70	1.95	1.5°	3.5	2.70	6.18	11.36	20.37	21.10	-
HPI92831	R1.0	2.0	4	1.5	20	70	1.95	2°	3.5	2.77	5.29	7.43	13.86	20.48	-
HPI92832	R1.0	2.0	4	1.5	25	70	1.95	0.5°	3.5	2.11	25.18	26.02	26.93	27.90	-
HPI92833	R1.0	2.0	4	1.5	25	70	1.95	1°	3.5	2.17	8.86	25.27	26.15	27.09	-
HPI92834	R1.0	2.0	4	1.5	25	70	1.95	1.5°	3.5	2.23	6.18	11.36	25.37	26.29	-
HPI92835	R1.0	2.0	4	1.5	30	70	1.95	0.5°	3.5	1.79	30.18	31.20	32.29	-	-
HPI92836	R1.0	2.0	4	1.5	30	70	1.95	1°	3.5	1.84	8.86	30.27	31.33	-	-
HPI92837	R1.0	2.0	4	1.5	35	80	1.95	0.5°	3.5	1.56	35.18	36.37	37.65	-	-
HPI92838	R1.0	2.0	4	1.5	40	80	1.95	0.5°	3.5	1.38	40.18	41.55	-	-	-
HPI92839	R1.0	2.0	4	1.5	50	90	1.95	0.5°	3.5	1.12	50.18	51.89	-	-	-
HPI92840	R1.0	2.0	6	1.5	25	70	1.95	2°	3.5	3.98	5.29	7.43	13.86	25.48	27.47
HPI92841	R1.0	2.0	6	1.5	30	70	1.95	1.5°	3.5	3.37	6.18	11.36	30.37	31.48	33.95
HPI92842	R1.0	2.0	6	1.5	30	70	1.95	2°	3.5	3.46	5.29	7.43	13.86	30.48	32.87
HPI92843	R1.0	2.0	6	1.5	35	80	1.95	1°	3.5	2.90	8.86	35.27	36.51	37.84	-
HPI92844	R1.0	2.0	6	1.5	35	80	1.95	1.5°	3.5	2.98	6.18	11.36	35.37	36.66	-
HPI92845	R1.0	2.0	6	1.5	40	80	1.95	1°	3.5	2.59	8.86	40.27	41.69	43.22	-

Size	Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R3	+0.001~-0.005	0~-0.010	h4
over R3	+0.003~-0.007	0~-0.012	* Shank Dia.>ø6 : h5

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◎ : Excellent ○ : Good

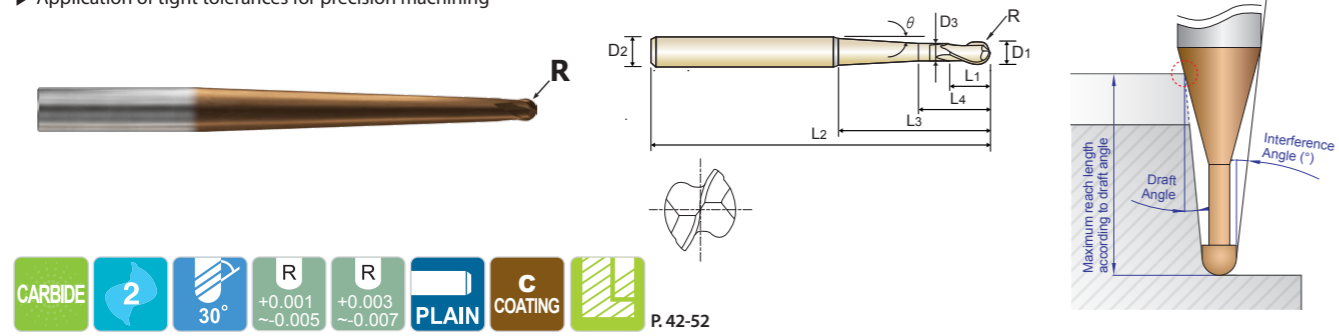
ISO	P										M					K																																																																																																																																																																																																																																																																																																																																
	Non-alloy steel					Low alloy steel					High alloyed steel, and tool steel					Stainless steel					Grey cast iron					Nodular cast iron					Malleable cast iron																																																																																																																																																																																																																																																																																																																	
Material Description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336

C-COATED SOLID CARBIDE END MILLS  
2 FLUTE BALL NOSE for RIB PROCESSING with TAPER NECK

SERIES

PLAIN SHANK **HPI92**

- ▶ Improvement of tool life by applying new coating
- ▶ Application of tight tolerances for precision machining



CARBIDE 2 30° R +0.001~-0.005 R +0.003~-0.007 PLAIN COATING P.42-52

R0.05-R3 R3.5-R6

Unit : mm

EDP No.	Radius of Ball Nose R	Mill Diameter D1	Shank Diameter D2	Length of Cut L1	Length Below Shank L3	Overall Length L2	Neck Diameter D3	Neck Taper Angle(°) θ°	Under Neck Parallel Length L4	Interference Angle (°)	Maximum reach lengths according to draft angle				
											0.5°	1°	1.5°	2°	3°
HPI92040	R2.0	4.0	6	3	20	80	3.85	1°	5	2.72	16.59	20.51	21.18	21.90	-
HPI92871	R2.0	4.0	6	3	30	80	3.85	1°	5	1.89	16.59	30.51	31.54	-	-
HPI92872	R2.0	4.0	6	3	40	80	3.85	1°	5	1.44	16.59	40.51	-	-	-
HPI92873	R2.0	4.0	6	3	50	90	3.85	1°	5	1.17	16.59	50.51	-	-	-
HPI92874	R2.0	4.0	6	3	61.1	110	3.85	1°	5	0.96	16.59	-	-	-	-
HPI92897	R2.5	5.0	8	10	30	80	4.85	1°	13	2.66	30.07	31.03	32.06	33.17	-
HPI92898	R2.5	5.0	8	10	40	90	4.85	1°	13	2.06	32.09	41.03	42.42	43.92	-
HPI92899	R2.5	5.0	8	10	60	110	4.85	1°	13	1.42	32.09	61.03	-	-	-
HPI92701	R2.5	5.0	8	10	90	140	4.85	1°	13	0.97	32.09	-	-	-	-
HPI92702	R2.5	5.0	8	10	74	150	4.75	1.5°	13	1.20	25.41	48.31	-	-	-
HPI92703	R2.5	5.0	8	10	100	150	4.85	0.5°	13	0.85	100.64	-	-	-	-
HPI92704	R3.0	6.0	8	12	30	80	5.85	1°	15	1.91	30.19	31.14	32.15	-	-
HPI92705	R3.0	6.0	8	12	40	90	5.85	1°	15	1.45	35.59	41.14	-	-	-
HPI92706	R3.0	6.0	8	12	45	95	5.85	1°	15	1.30	35.59	46.14	-	-	-
HPI92707	R3.0	6.0	8	12	50	100	5.85	1°	15	1.18	35.59	51.14	-	-	-
HPI92708	R3.0	6.0	8	12	120	200	5.85	0.5°	15	0.49	-	-	-	-	-
HPI92709	R3.0	6.0	10	12	30	80	5.85	3°	15	3.60	19.11	23.14	29.84	30.99	33.27
HPI92710	R3.0	6.0	10	12	50	100	5.85	1.5°	15	2.23	25.29	47.58	51.61	53.43	-
HPI92711	R3.0	6.0	10	12	60	110	5.85	1°	15	1.85	35.59	61.14	63.24	-	-
HPI92712	R3.0	6.0	10	12	70	120	5.85	1°	15	1.61	35.59	71.14	73.60	-	-
HPI92713	R3.0	6.0	10	12	80	130	5.85	1°	15	1.42	35.59	81.14	-	-	-
HPI92714	R3.0	6.0	10	12	96	200	5.75	1.5°	15	1.23	28.16	53.31	-	-	-
HPI92715	R3.0	6.0	10	12	120	200	5.85	1°	15	0.97	35.59	-	-	-	-
HPI92070	R3.5	7.0	10	14	40	90	6.7	3°	17	2.25	23.13	28.03	36.20	40.94	-
HPI92875	R3.5	7.0	10	14	45	95	6.7	1°	17	1.87	45.09	46.54	48.09	-	-
HPI92876	R3.5	7.0	10	14	60	110	6.7	1.5°	17	1.47	32.34	60.04	-	-	-

Size	Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to R3	+0.001~-0.005	0~-0.010	h4
over R3	+0.003~-0.007	0~-0.012	* Shank Dia.>φ6 : h5

NEXT PAGE ▶

◎ : Excellent ○ : Good

ISO Material Description	P										M					K																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
	Non-alloy steel					Low alloy steel					High alloyed steel, and tool steel					Stainless steel					Grey cast iron					Nodular cast iron					Malleable cast iron																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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HRc	13	25	28	32	38	44	48	52	58	63	68	73	78	83	88	93	98	103	108	113	118	123	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198	203	208	213	218	223	228	233	238	243	248	253	258	263	268	273	278	283	288	293	298	303	308	313	318	323	328	333	338	343	348	353	358	363	368	373	378	383	388	393	398	403	408	413	418	423	428	433	438	443	448	453	458	463	468	473	478	483	488	493	498	503	508	513	518	523	528	533	538	543	548	553	558	563	568	573	578	583	588	593	598	603	608	613	618	623	628	633	638	643	648	653	658	663	668	673	678	683	688	693	698	703	708	713	718	723	728	733	738	743	748	753	758	763	768	773	778	783	788	793	798	803	808	813	818	823	828	833	838	843	848	853	858	863	868	873	878	883	888	893	898	903	908	913	918	923	928	933	938	943	948	953	958	963	968	973	978	983	988	993	998	1003	1008	1013	1018	1023	1028	1033	1038	1043	1048	1053	1058	1063	1068	1073	1078	1083	1088	1093	1098	1103	1108	1113	1118	1123	1128	1133	1138	1143	1148	1153	1158	1163	1168	1173	1178	1183	1188	1193	1198	1203	1208	1213	1218	1223	1228	1233	1238	1243	1248	1253	1258	1263	1268	1273	1278	1283	1288	1293	1298	1303	1308	1313	1318	1323	1328	1333	1338	1343	1348	1353	1358	1363	1368	1373	1378	1383	1388	1393	1398	1403	1408	1413	1418	1423	1428	1433	1438	1443	1448	1453	1458	1463	1468	1473	1478	1483	1488	1493	1498	1503	1508	1513	1518	1523	1528	1533	1538	1543	1548	1553	1558	1563	1568	1573	1578	1583	1588	1593	1598	1603	1608	1613	1618	1623	1628	1633	1638	1643	1648	1653	1658	1663	1668	1673	1678	1683	1688	1693	1698	1703	1708	1713	1718	1723	1728	1733	1738	1743	1748	1753	1758	1763	1768	1773	1778	1783	1788	1793	1798	1803	1808	1813	1818	1823	1828	1833	1838	1843	1848	1853	1858	1863	1868	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973	1978	1983	1988	1993	1998	2003	2008	2013	2018	2023	2028	2033	2038	2043	2048	2053	2058	2063	2068	2073	2078	2083	2088	2093	2098	2103	2108	2113	2118	2123	2128	2133	2138	2143	2148	2153	2158	2163	2168	2173	2178	2183	2188	2193	2198	2203	2208	2213	2218	2223	2228	2233	2238	2243	2248	2253	2258	2263	2268	2273	2278	2283	2288	2293	2298	2303	2308	2313	2318	2323	2328	2333	2338	2343	2348	2353	2358	2363	2368	2373	2378	2383	2388	2393	2398	2403	2408	2413	2418	2423	2428	2433	2438	2443	2448	2453	2458	2463	2468	2473	2478	2483	2488	2493	2498	2503	2508	2513	2518	2523	2528	2533	2538	2543	2548	2553	2558	2563	2568	2573	2578	2583	2588	2593	2598	2603	2608	2613	2618	2623	2628	2633	2638	2643	2648	2653	2658	2663	2668	2673	2678	2683	2688	2693	2698	2703	2708	2713	2718	2723	2728	2733	2738	2743	2748	2753	2758	2763	2768	2773	2778	2783	2788	2793	2798	2803	2808	2813	2818	2823	2828	2833	2838	2843	2848	2853	2858	2863	2868	2873	2878	2883	2888	2893	2898	2903	2908	2913	2918	2923	2928	2933	2938	2943	2948	2953	2958	2963	2968	2973	2978	2983	2988	2993	2998	3003	3008	3013	3018	3023	3028	3033	3038	3043	3048	3053	3058	3063	3068	3073	3078	3083	3088	3093	3098	3103	3108	3113	3118	3123	3128	3133	3138	3143	3148	3153	3158	3163	3168	3173	3178	3183	3188	3193	3198	3203	3208	3213	3218	3223	3228	3233	3238	3243	3248	3253	3258	3263	3268	3273	3278	3283	3288	3293	3298	3303	3308	3313	3318	3323	3328	3333	3338	3343	3348	3353	3358	3363	3368	3373	3378	3383	3388	3393	3398	3403	3408	3413	3418	3423	3428	3433	3438	3443	3448	3453	3458	3463	3468	3473	3478	3483	3488	3493	3498	3503	3508	3513	3518	3523	3528	3533	3538	3543	3548	3553	3558	3563	3568	3573	3578	3583	3588	3593	3598	3603	3608	3613	3618	3623	3628	3633	3638	3643	3648	3653	3658	3663	3668	3673	3678	3683	3688	3693	3698	3703	3708	3713	3718	3723	3728	3733	3738	3743	3748	3753	3758	3763	3768	3773	3778	3783	3788	3793	3798	3803	3808	3813	3818	3823	3828	3833	3838	3843	3848	3853	3858	3863	3868	3873	3878	3883	3888	3893	3898	3903	3908	3913	3918	3923	3928	3933	3938	3943	3948	3953	3958	3963	3968	3973	3978	3983	3988	3993	3998	4003	4008	4013	4018	4023	4028	4033	4038	4043	4048	4053	4058	4063	4068	4073	4078	4083	4088	4093	4098	4103	4108	4113	4118	4123	4128	4133	4138	4143	4148	4153	4158	4163	4168	4173	4178	4183	4188	4193	4198



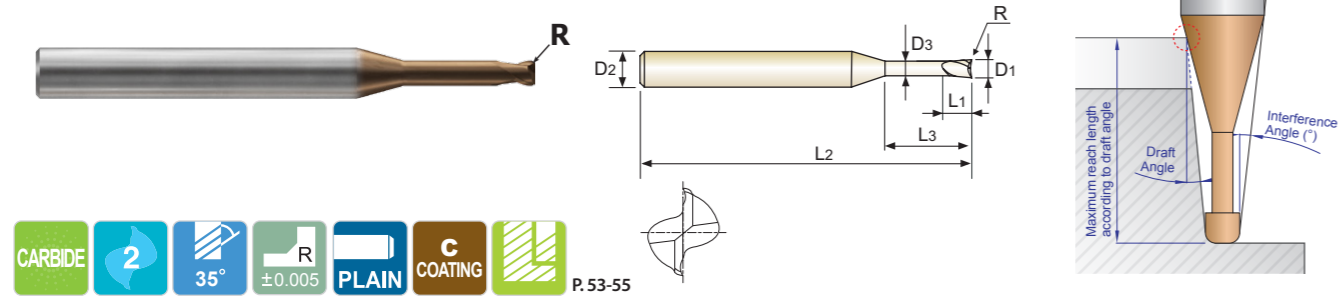




C-COATED SOLID CARBIDE END MILLS  
2 FLUTE CORNER RADIUS for RIB PROCESSING

SERIES  
PLAIN SHANK **HPI89**

- ▶ Improvement of tool life by applying new coating
- ▶ Application of tight tolerances for precision machining



CARBIDE 2 35° ±0.005 PLAIN COATING P.53-55

Unit : mm

EDP No.	Corner Radius R	Mill Diameter D <sub>1</sub>	Shank Diameter D <sub>2</sub>	Length of Cut L <sub>1</sub>	Length Below Shank L <sub>3</sub>	Overall Length L <sub>2</sub>	Neck Diameter D <sub>3</sub>	Interference Angle (°)	Maximum reach lengths according to draft angle				
									0.5°	1°	1.5°	2°	3°
HPI89996	R0.1	1.0	4	0.8	10	50	0.95	5.50	10.66	11.25	11.89	12.62	13.50
HPI89997	R0.2	1.0	4	0.8	10	50	0.95	5.53	10.66	11.23	11.88	12.60	13.48
HPI89998	R0.3	1.0	4	0.8	10	50	0.95	5.57	10.65	11.22	11.86	12.57	13.47
HPI89999	R0.1	1.0	4	0.8	12	55	0.95	4.87	12.77	13.46	14.24	15.00	15.84
HPI89801	R0.2	1.0	4	0.8	12	55	0.95	4.90	12.76	13.45	14.22	14.99	15.82
HPI89802	R0.1	1.0	4	0.8	16	60	0.95	3.97	16.98	17.90	18.92	19.42	20.51
HPI89803	R0.2	1.0	4	0.8	16	60	0.95	3.99	16.97	17.89	18.92	19.41	20.49
HPI89804	R0.3	1.0	4	0.8	16	60	0.95	4.01	16.97	17.88	18.90	19.40	20.47
HPI89805	R0.1	1.0	4	0.8	20	60	0.95	3.35	21.19	22.34	23.23	23.85	25.18
HPI89806	R0.2	1.0	4	0.8	20	60	0.95	3.37	21.18	22.33	23.23	23.84	25.16
HPI89807	R0.3	1.0	4	0.8	20	60	0.95	3.38	21.17	22.32	23.22	23.83	25.15
HPI89015	R0.1	1.5	4	1.35	4	50	1.45	8.21	4.23	4.37	4.53	4.69	5.06
HPI89808	R0.2	1.5	4	1.35	4	50	1.45	8.31	4.22	4.36	4.51	4.68	5.04
HPI89809	R0.1	1.5	4	1.35	8	50	1.45	5.64	8.36	8.65	8.96	9.29	10.04
HPI89810	R0.2	1.5	4	1.35	8	50	1.45	5.68	8.36	8.64	8.95	9.28	10.01
HPI89811	R0.3	1.5	4	1.35	8	50	1.45	5.73	8.36	8.64	8.94	9.26	9.99
HPI89812	R0.2	1.5	4	1.35	12	55	1.45	4.32	12.49	12.92	13.38	13.88	14.99
HPI89813	R0.1	1.5	4	1.35	15	55	1.45	3.64	15.60	16.14	16.72	17.34	18.74
HPI89814	R0.2	1.5	4	1.35	15	55	1.45	3.66	15.59	16.13	16.71	17.33	18.71
HPI89815	R0.3	1.5	4	1.35	15	55	1.45	3.68	15.59	16.12	16.70	17.31	18.69
HPI89816	R0.1	1.5	4	1.35	20	60	1.45	2.90	20.77	21.49	22.26	23.09	-
HPI89817	R0.2	1.5	4	1.35	20	60	1.45	2.91	20.76	21.48	22.25	23.07	-
HPI89818	R0.3	1.5	4	1.35	20	60	1.45	2.93	20.76	21.47	22.24	23.06	-
HPI89020	R0.2	2.0	4	1.7	6	50	1.95	5.93	6.29	6.50	6.73	6.98	7.53
HPI89819	R0.5	2.0	4	1.7	6	50	1.95	6.12	6.28	6.48	6.70	6.93	7.45
HPI89820	R0.2	2.0	4	1.7	8	50	1.95	4.92	8.36	8.64	8.95	9.28	10.01

Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
±0.005	0~-0.010	h4

NEXT PAGE ▶

◎ : Excellent ○ : Good

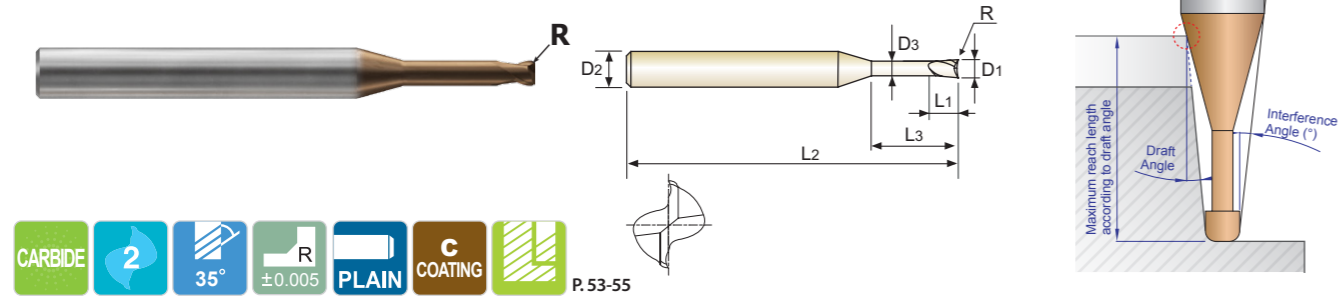
ISO Material Description	P										M					K																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
	Non-alloy steel					Low alloy steel					High alloyed steel, and tool steel					Stainless steel					Grey cast iron					Nodular cast iron					Malleable cast iron																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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HRC	13	25	28	32	38	44	48	52	58	63	68	73	78	83	88	93	98	103	108	113	118	123	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198	203	208	213	218	223	228	233	238	243	248	253	258	263	268	273	278	283	288	293	298	303	308	313	318	323	328	333	338	343	348	353	358	363	368	373	378	383	388	393	398	403	408	413	418	423	428	433	438	443	448	453	458	463	468	473	478	483	488	493	498	503	508	513	518	523	528	533	538	543	548	553	558	563	568	573	578	583	588	593	598	603	608	613	618	623	628	633	638	643	648	653	658	663	668	673	678	683	688	693	698	703	708	713	718	723	728	733	738	743	748	753	758	763	768	773	778	783	788	793	798	803	808	813	818	823	828	833	838	843	848	853	858	863	868	873	878	883	888	893	898	903	908	913	918	923	928	933	938	943	948	953	958	963	968	973	978	983	988	993	998	1003	1008	1013	1018	1023	1028	1033	1038	1043	1048	1053	1058	1063	1068	1073	1078	1083	1088	1093	1098	1103	1108	1113	1118	1123	1128	1133	1138	1143	1148	1153	1158	1163	1168	1173	1178	1183	1188	1193	1198	1203	1208	1213	1218	1223	1228	1233	1238	1243	1248	1253	1258	1263	1268	1273	1278	1283	1288	1293	1298	1303	1308	1313	1318	1323	1328	1333	1338	1343	1348	1353	1358	1363	1368	1373	1378	1383	1388	1393	1398	1403	1408	1413	1418	1423	1428	1433	1438	1443	1448	1453	1458	1463	1468	1473	1478	1483	1488	1493	1498	1503	1508	1513	1518	1523	1528	1533	1538	1543	1548	1553	1558	1563	1568	1573	1578	1583	1588	1593	1598	1603	1608	1613	1618	1623	1628	1633	1638	1643	1648	1653	1658	1663	1668	1673	1678	1683	1688	1693	1698	1703	1708	1713	1718	1723	1728	1733	1738	1743	1748	1753	1758	1763	1768	1773	1778	1783	1788	1793	1798	1803	1808	1813	1818	1823	1828	1833	1838	1843	1848	1853	1858	1863	1868	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973	1978	1983	1988	1993	1998	2003	2008	2013	2018	2023	2028	2033	2038	2043	2048	2053	2058	2063	2068	2073	2078	2083	2088	2093	2098	2103	2108	2113	2118	2123	2128	2133	2138	2143	2148	2153	2158	2163	2168	2173	2178	2183	2188	2193	2198	2203	2208	2213	2218	2223	2228	2233	2238	2243	2248	2253	2258	2263	2268	2273	2278	2283	2288	2293	2298	2303	2308	2313	2318	2323	2328	2333	2338	2343	2348	2353	2358	2363	2368	2373	2378	2383	2388	2393	2398	2403	2408	2413	2418	2423	2428	2433	2438	2443	2448	2453	2458	2463	2468	2473	2478	2483	2488	2493	2498	2503	2508	2513	2518	2523	2528	2533	2538	2543	2548	2553	2558	2563	2568	2573	2578	2583	2588	2593	2598	2603	2608	2613	2618	2623	2628	2633	2638	2643	2648	2653	2658	2663	2668	2673	2678	2683	2688	2693	2698	2703	2708	2713	2718	2723	2728	2733	2738	2743	2748	2753	2758	2763	2768	2773	2778	2783	2788	2793	2798	2803	2808	2813	2818	2823	2828	2833	2838	2843	2848	2853	2858	2863	2868	2873	2878	2883	2888	2893	2898	2903	2908	2913	2918	2923	2928	2933	2938	2943	2948	2953	2958	2963	2968	2973	2978	2983	2988	2993	2998	3003	3008	3013	3018	3023	3028	3033	3038	3043	3048	3053	3058	3063	3068	3073	3078	3083	3088	3093	3098	3103	3108	3113	3118	3123	3128	3133	3138	3143	3148	3153	3158	3163	3168	3173	3178	3183	3188	3193	3198	3203	3208	3213	3218	3223	3228	3233	3238	3243	3248	3253	3258	3263	3268	3273	3278	3283	3288	3293	3298	3303	3308	3313	3318	3323	3328	3333	3338	3343	3348	3353	3358	3363	3368	3373	3378	3383	3388	3393	3398	3403	3408	3413	3418	3423	3428	3433	3438	3443	3448	3453	3458	3463	3468	3473	3478	3483	3488	3493	3498	3503	3508	3513	3518	3523	3528	3533	3538	3543	3548	3553	3558	3563	3568	3573	3578	3583	3588	3593	3598	3603	3608	3613	3618	3623	3628	3633	3638	3643	3648	3653	3658	3663	3668	3673	3678	3683	3688	3693	3698	3703	3708	3713	3718	3723	3728	3733	3738	3743	3748	3753	3758	3763	3768	3773	3778	3783	3788	3793	3798	3803	3808	3813	3818	3823	3828	3833	3838	3843	3848	3853	3858	3863	3868	3873	3878	3883	3888	3893	3898	3903	3908	3913	3918	3923	3928	3933	3938	3943	3948	3953	3958	3963	3968	3973	3978	3983	3988	3993	3998	4003	4008	4013	4018	4023	4028	4033	4038	4043	4048	4053	4058	4063	4068	4073	4078	4083	4088	4093	4098	4103	4108	4113	4118	4123	4128	4133	4138	4143	4148	4153	4158	4163	4168	4173	4178	4183	4188	4193	4198	4203	4208	4213	4218	4223	4228	4233	4238	4243	4248	4253	4258	4263	4268	4273	4278	4283	4288	4293	4298	4303	4308	4313	4318	4323	4328	4333	4338	4343	4

### C-COATED SOLID CARBIDE END MILLS 2 FLUTE CORNER RADIUS for RIB PROCESSING

SERIES

PLAIN SHANK **HPI89**

- ▶ Improvement of tool life by applying new coating
- ▶ Application of tight tolerances for precision machining



Unit : mm

EDP No.	Corner Radius R	Mill Diameter D <sub>1</sub>	Shank Diameter D <sub>2</sub>	Length of Cut L <sub>1</sub>	Length Below Shank L <sub>3</sub>	Overall Length L <sub>2</sub>	Neck Diameter D <sub>3</sub>	Interference Angle (°)	Maximum reach lengths according to draft angle				
									0.5°	1°	1.5°	2°	3°
HPI89846	R0.3	3.0	6	2.5	20	65	2.85	3.36	20.95	21.67	22.44	23.27	25.14
HPI89847	R0.5	3.0	6	2.5	20	65	2.85	3.38	20.95	21.66	22.42	23.24	25.09
HPI89848	R0.2	3.0	6	2.5	30	75	2.85	2.41	31.29	32.38	33.54	34.79	-
HPI89849	R0.3	3.0	6	2.5	30	75	2.85	2.41	31.29	32.37	33.53	34.77	-
HPI89850	R0.5	3.0	6	2.5	30	75	2.85	2.43	31.28	32.36	33.51	34.74	-
HPI89851	R0.2	3.0	6	2.5	35	80	2.85	2.11	36.46	37.72	39.08	40.54	-
HPI89852	R0.5	3.0	6	2.5	35	80	2.85	2.13	36.45	37.70	39.05	40.49	-

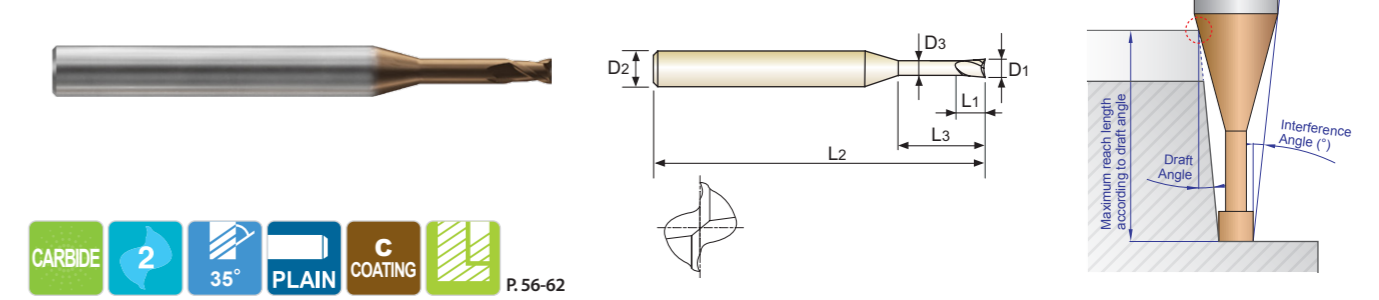
Corner Radius Tolerance (mm)	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
±0.005	0~-0.010	h4

### C-COATED SOLID CARBIDE END MILLS 2 FLUTE SQUARE for RIB PROCESSING

SERIES

PLAIN SHANK **HPI88**

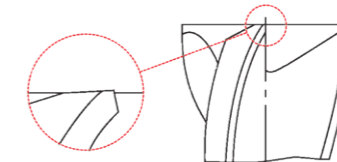
- ▶ Improvement of tool life by applying new coating
- ▶ Application of tight tolerances for precision machining



Unit : mm

EDP No.	Mill Diameter D <sub>1</sub>	Shank Diameter D <sub>2</sub>	Length of Cut L <sub>1</sub>	Length Below Shank L <sub>3</sub>	Overall Length L <sub>2</sub>	Neck Diameter D <sub>3</sub>	Interference Angle (°)	Maximum reach lengths according to draft angle				
								0.5°	1°	1.5°	2°	3°
HPI88001	0.1	4	0.08	0.3	45	0.085	14.38	0.36	0.38	0.40	0.43	0.49
HPI88901	0.1	4	0.08	0.5	45	0.085	14.03	0.57	0.60	0.64	0.68	0.77
HPI88902	0.1	4	0.08	0.75	45	0.085	13.61	0.83	0.88	0.93	0.99	1.13
HPI88903	0.1	4	0.08	1	45	0.085	13.21	1.10	1.16	1.22	1.30	1.48
HPI880015	0.15	4	0.12	0.3	45	0.135	14.37	0.36	0.38	0.40	0.43	0.49
HPI88904	0.15	4	0.12	0.5	45	0.135	14.01	0.57	0.60	0.64	0.68	0.77
HPI88905	0.15	4	0.12	0.75	45	0.135	13.59	0.83	0.88	0.93	0.99	1.13
HPI88906	0.15	4	0.12	1	45	0.135	13.19	1.10	1.16	1.22	1.30	1.48
HPI88907	0.15	4	0.12	1.5	45	0.135	12.46	1.62	1.71	1.81	1.92	2.19
HPI88002	0.2	4	0.15	0.5	45	0.17	13.95	0.62	0.65	0.69	0.73	0.83
HPI88908	0.2	4	0.15	0.75	45	0.17	13.53	0.88	0.93	0.98	1.04	1.19
HPI88909	0.2	4	0.15	1	45	0.17	13.13	1.14	1.20	1.27	1.35	1.54
HPI88910	0.2	4	0.15	1.5	45	0.17	12.39	1.67	1.76	1.86	1.98	2.26
HPI88911	0.2	4	0.15	2	45	0.17	11.73	2.19	2.31	2.45	2.60	2.97
HPI88912	0.2	4	0.15	2.5	45	0.17	11.14	2.72	2.87	3.04	3.22	3.68
HPI88913	0.2	4	0.15	3	45	0.17	10.61	3.25	3.42	3.62	3.85	4.39
HPI88003	0.3	4	0.25	1	45	0.27	13.08	1.14	1.20	1.27	1.35	1.54
HPI88914	0.3	4	0.25	1.5	45	0.27	12.33	1.67	1.76	1.86	1.98	2.26
HPI88915	0.3	4	0.25	2	45	0.27	11.67	2.19	2.31	2.45	2.60	2.97
HPI88916	0.3	4	0.25	2.5	45	0.27	11.06	2.72	2.87	3.04	3.22	3.68
HPI88917	0.3	4	0.25	3	45	0.27	10.52	3.25	3.42	3.62	3.85	4.39
HPI88004	0.4	4	0.3	1	45	0.37	13.04	1.14	1.20	1.27	1.35	1.54
HPI88918	0.4	4	0.3	1.5	45	0.37	12.27	1.67	1.76	1.86	1.98	2.26
HPI88919	0.4	4	0.3	2	45	0.37	11.59	2.19	2.31	2.45	2.60	2.97
HPI88920	0.4	4	0.3	2.5	45	0.37	10.98	2.72	2.87	3.04	3.22	3.68
HPI88921	0.4	4	0.3	3	45	0.37	10.44	3.25	3.42	3.62	3.85	4.39

Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
0~-0.010	h4



**Enforced Cutting Edge**

NEXT PAGE ▶

◎ : Excellent ○ : Good

ISO Material Description	P										M					K																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	Non-alloy steel					Low alloy steel					High alloyed steel, and tool steel					Stainless steel					Grey cast iron					Nodular cast iron					Malleable cast iron																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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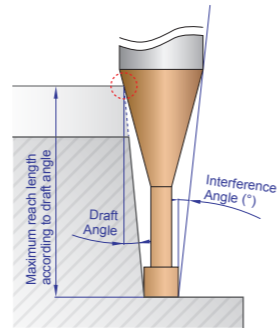
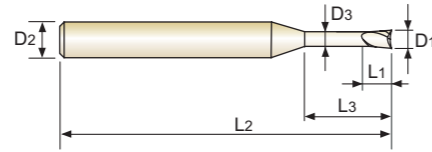


C-COATED SOLID CARBIDE END MILLS  
**2 FLUTE SQUARE for RIB PROCESSING**

SERIES

PLAIN SHANK **HPI88**

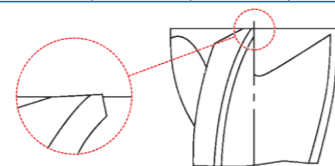
- ▶ Improvement of tool life by applying new coating
- ▶ Application of tight tolerances for precision machining



Unit : mm

EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter	Interference Angle (°)	Maximum reach lengths according to draft angle				
								0.5°	1°	1.5°	2°	3°
HPI88969	1.0	4	0.8	22	60	0.95	3.10	23.29	24.57	25.40	26.07	27.53
HPI88012	1.2	4	1	6	50	1.15	7.05	6.30	6.52	6.75	7.01	7.57
HPI88970	1.2	4	1	8	50	1.15	6.00	8.37	8.66	8.97	9.31	10.06
HPI88971	1.2	4	1	10	50	1.15	5.22	10.43	10.80	11.19	11.61	12.55
HPI88972	1.2	4	1	12	50	1.15	4.62	12.50	12.94	13.40	13.91	15.03
HPI88973	1.2	4	1	16	60	1.15	3.76	16.64	17.21	17.84	18.50	20.01
HPI88014	1.4	4	1.1	6	50	1.35	6.77	6.30	6.52	6.75	7.01	7.57
HPI88974	1.4	4	1.1	12	50	1.35	4.39	12.50	12.94	13.40	13.91	15.03
HPI88015	1.5	4	1.2	4	50	1.45	8.12	4.23	4.38	4.54	4.71	5.09
HPI88975	1.5	4	1.2	6	50	1.45	6.63	6.30	6.52	6.75	7.01	7.57
HPI88976	1.5	4	1.2	8	50	1.45	5.60	8.37	8.66	8.97	9.31	10.06
HPI88977	1.5	4	1.2	10	50	1.45	4.84	10.43	10.80	11.19	11.61	12.55
HPI88978	1.5	4	1.2	12	50	1.45	4.27	12.50	12.94	13.40	13.91	15.03
HPI88979	1.5	4	1.2	14	60	1.45	3.81	14.57	15.08	15.62	16.21	17.52
HPI88980	1.5	4	1.2	16	60	1.45	3.45	16.64	17.21	17.84	18.50	20.01
HPI88981	1.5	4	1.2	18	60	1.45	3.14	18.70	19.35	20.05	20.80	22.49
HPI88982	1.5	4	1.2	20	60	1.45	2.89	20.77	21.49	22.27	23.10	-
HPI88983	1.5	4	1.2	25	70	1.45	2.41	25.94	26.84	27.81	28.85	-
HPI88984	1.5	4	1.2	30	70	1.45	2.06	31.11	32.19	33.35	34.60	-
HPI88985	1.5	4	1.2	35	80	1.45	1.80	36.27	37.54	38.89	-	-
HPI88016	1.6	4	1.3	6	50	1.55	6.48	6.30	6.52	6.75	7.01	7.57
HPI88986	1.6	4	1.3	8	50	1.55	5.45	8.37	8.66	8.97	9.31	10.06
HPI88018	1.8	4	1.4	6	50	1.75	6.16	6.30	6.52	6.75	7.01	7.57
HPI88987	1.8	4	1.4	8	50	1.75	5.15	8.37	8.66	8.97	9.31	10.06
HPI88988	1.8	4	1.4	10	50	1.75	4.43	10.43	10.80	11.19	11.61	12.55
HPI88989	1.8	4	1.4	12	50	1.75	3.88	12.50	12.94	13.40	13.91	15.03

Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
0~-0.010	h4



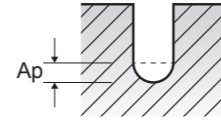
Enforced Cutting Edge

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◎ : Excellent ○ : Good

ISO Material Description	P										M					K																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
	Non-alloy steel					Low alloy steel					High alloyed steel, and tool steel					Stainless steel					Grey cast iron					Nodular cast iron					Malleable cast iron																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
VDI 3323	1	2	3	4	5	6	7	8	9	10	11.1	11.2	12	13	14.1	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38.1	38.2	39.1	39.2	39.3	40	41																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
HRC	13	25	28	32	38	44	48	52	58	63	68	73	78	83	88	93	98	103	108	113	118	123	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198	203	208	213	218	223	228	233	238	243	248	253	258	263	268	273	278	283	288	293	298	303	308	313	318	323	328	333	338	343	348	353	358	363	368	373	378	383	388	393	398	403	408	413	418	423	428	433	438	443	448	453	458	463	468	473	478	483	488	493	498	503	508	513	518	523	528	533	538	543	548	553	558	563	568	573	578	583	588	593	598	603	608	613	618	623	628	633	638	643	648	653	658	663	668	673	678	683	688	693	698	703	708	713	718	723	728	733	738	743	748	753	758	763	768	773	778	783	788	793	798	803	808	813	818	823	828	833	838	843	848	853	858	863	868	873	878	883	888	893	898	903	908	913	918	923	928	933	938	943	948	953	958	963	968	973	978	983	988	993	998	1003	1008	1013	1018	1023	1028	1033	1038	1043	1048	1053	1058	1063	1068	1073	1078	1083	1088	1093	1098	1103	1108	1113	1118	1123	1128	1133	1138	1143	1148	1153	1158	1163	1168	1173	1178	1183	1188	1193	1198	1203	1208	1213	1218	1223	1228	1233	1238	1243	1248	1253	1258	1263	1268	1273	1278	1283	1288	1293	1298	1303	1308	1313	1318	1323	1328	1333	1338	1343	1348	1353	1358	1363	1368	1373	1378	1383	1388	1393	1398	1403	1408	1413	1418	1423	1428	1433	1438	1443	1448	1453	1458	1463	1468	1473	1478	1483	1488	1493	1498	1503	1508	1513	1518	1523	1528	1533	1538	1543	1548	1553	1558	1563	1568	1573	1578	1583	1588	1593	1598	1603	1608	1613	1618	1623	1628	1633	1638	1643	1648	1653	1658	1663	1668	1673	1678	1683	1688	1693	1698	1703	1708	1713	1718	1723	1728	1733	1738	1743	1748	1753	1758	1763	1768	1773	1778	1783	1788	1793	1798	1803	1808	1813	1818	1823	1828	1833	1838	1843	1848	1853	1858	1863	1868	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973	1978	1983	1988	1993	1998	2003	2008	2013	2018	2023	2028	2033	2038	2043	2048	2053	2058	2063	2068	2073	2078	2083	2088	2093	2098	2103	2108	2113	2118	2123	2128	2133	2138	2143	2148	2153	2158	2163	2168	2173	2178	2183	2188	2193	2198	2203	2208	2213	2218	2223	2228	2233	2238	2243	2248	2253	2258	2263	2268	2273	2278	2283	2288	2293	2298	2303	2308	2313	2318	2323	2328	2333	2338	2343	2348	2353	2358	2363	2368	2373	2378	2383	2388	2393	2398	2403	2408	2413	2418	2423	2428	2433	2438	2443	2448	2453	2458	2463	2468	2473	2478	2483	2488	2493	2498	2503	2508	2513	2518	2523	2528	2533	2538	2543	2548	2553	2558	2563	2568	2573	2578	2583	2588	2593	2598	2603	2608	2613	2618	2623	2628	2633	2638	2643	2648	2653	2658	2663	2668	2673	2678	2683	2688	2693	2698	2703	2708	2713	2718	2723	2728	2733	2738	2743	2748	2753	2758	2763	2768	2773	2778	2783	2788	2793	2798	2803	2808	2813	2818	2823	2828	2833	2838	2843	2848	2853	2858	2863	2868	2873	2878	2883	2888	2893	2898	2903	2908	2913	2918	2923	2928	2933	2938	2943	2948	2953	2958	2963	2968	2973	2978	2983	2988	2993	2998	3003	3008	3013	3018	3023	3028	3033	3038	3043	3048	3053	3058	3063	3068	3073	3078	3083	3088	3093	3098	3103	3108	3113	3118	3123	3128	3133	3138	3143	3148	3153	3158	3163	3168	3173	3178	3183	3188	3193	3198	3203	3208	3213	3218	3223	3228	3233	3238	3243	3248	3253	3258	3263	3268	3273	3278	3283	3288	3293	3298	3303	3308	3313	3318	3323	3328	3333	3338	3343	3348	3353	3358	3363	3368	3373	3378	3383	3388	3393	3398	3403	3408	3413	3418	3423	3428	3433	3438	3443	3448	3453	3458	3463	3468	3473	3478	3483	3488	3493	3498	3503	3508	3513	3518	3523	3528	3533	3538	3543	3548	3553	3558	3563	3568	3573	3578	3583	3588	3593	3598	3603	3608	3613	3618	3623	3628	3633	3638	3643	3648	3653	3658	3663	3668	3673	3678	3683	3688	3693	3698	3703	3708	3713	3718	3723	3728	3733	3738	3743	3748	3753	3758	3763	3768	3773	3778	3783	3788	3793	3798	3803	3808	3813	3818	3823	3828	3833	3838	3843	3848	3853	3858	3863	3868	3873	3878	3883	3888	3893	3898	3903	3908	3913	3918	3923	3928	3933	3938	3943	3948	3953	3958	3963	3968	3973	3978	3983	3988	3993	3998	4003	4008	4013	4018	4023	4028	4033	4038	4043	4048	4053	4058	4063	4068	4073	4078	4083	4088	4093	4098	4103	4108	4113	4118	4123	4128	4133	4138	4143	4148	4153	4158	4163	4168	4173	4178	4183	4188	4193	4198	4203	4208	4213	4218	4223	4228	4233	4238	4243	4248	4253	4258	4263	4268	4273	4278	4283	4288	4293	4298	4303	4308	4313	4318	4323	4328	4333	4338	4343	4348	4353	4358	4363	4368	4373	4378	4383	4388	4393	4398	4403	44





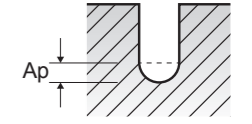
Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev/min. FEED = mm/min. LBS = Length Below Shank

### HPI91, HPI92 SERIES 2 FLUTE BALL NOSE for RIB PROCESSING

ISO	VDI 3323	Material Description	Parameter	Diameter (Ø)																	
				0.2		0.2		0.2		0.2		0.2		0.2		0.3		0.3		0.3	
				L.B.S	0.3	0.5	0.75	1	1.25	1.5	1.75	2	2.5	3	5	0.5	0.6	0.75	1	1.25	1.5
P	5	Non-alloy steel	Vc	31	31	31	31	28	28	28	28	25	25	9	46	46	46	46	46	46	42
			fz	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.010	0.010	0.007	0.015	0.015	0.015	0.015	0.015	0.015	0.014
			RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	49178	44260
			FEED	1180	1180	1180	1180	974	974	974	974	787	787	207	1475	1475	1475	1475	1475	1475	1239
	8-9	Low alloy steel	Vc	31	31	31	31	28	28	28	25	25	9	46	46	46	46	46	46	42	
			fz	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.010	0.010	0.007	0.015	0.015	0.015	0.015	0.015	0.014	
			RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	49178	44260
			FEED	1180	1180	1180	1180	974	974	974	974	787	787	207	1475	1475	1475	1475	1475	1475	1239
	11.1	High alloyed steel, and tool steel	Vc	31	31	31	31	28	28	28	25	25	9	46	46	46	46	46	46	42	
			fz	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.010	0.010	0.007	0.015	0.015	0.015	0.015	0.015	0.014	
			RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	49178	44260
			FEED	1180	1180	1180	1180	974	974	974	974	787	787	207	1475	1475	1475	1475	1475	1475	1239
11.2	High alloyed steel, and tool steel	Vc	31	31	31	31	28	28	28	25	25	9	46	46	46	46	46	46	42		
		fz	0.011	0.011	0.011	0.011	0.010	0.010	0.010	0.010	0.009	0.009	0.007	0.014	0.014	0.014	0.014	0.014	0.013		
		RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	49178	44260	
		FEED	1082	1082	1082	1082	885	885	885	885	708	708	207	1377	1377	1377	1377	1377	1377	1151	
H	38.1	Hardened steel	Vc	31	31	31	31	28	28	28	25	25	9	46	46	46	46	46	42		
			fz	0.011	0.011	0.011	0.011	0.010	0.010	0.010	0.010	0.009	0.009	0.007	0.014	0.014	0.014	0.014	0.014	0.013	
			RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	49178	44260
			FEED	1082	1082	1082	1082	885	885	885	885	708	708	207	1377	1377	1377	1377	1377	1377	1151
	38.2	Hardened steel	Vc	29	29	29	29	26	26	26	23	23	9	41	41	41	41	41	41	37	
			fz	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.008	0.008	0.006	0.013	0.013	0.013	0.013	0.013	0.012	
			RPM	45900	45900	45900	45900	41310	41310	41310	41310	36720	36720	13770	43714	43714	43714	43714	43714	43714	39343
			FEED	918	918	918	918	744	744	744	744	588	588	165	1137	1137	1137	1137	1137	1137	944
	39.1	Hardened steel	Vc	26	26	26	26	23	23	23	21	21	8	41	41	41	41	41	41	37	
			fz	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.008	0.008	0.006	0.012	0.012	0.012	0.012	0.012	0.011	
			RPM	40983	40983	40983	40983	36885	36885	36885	36885	32786	32786	12295	43714	43714	43714	43714	43714	43714	39343
			FEED	820	820	820	820	664	664	664	664	525	525	148	1049	1049	1049	1049	1049	1049	866
39.2	Hardened steel	Vc	21	21	21	21	19	19	19	16	16	6	36	36	36	36	36	36	32		
		fz	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.008	0.008	0.006	0.012	0.012	0.012	0.012	0.012	0.011		
		RPM	32786	32786	32786	32786	29507	29507	29507	29507	26229	26229	9836	38250	38250	38250	38250	38250	38250	34425	
		FEED	656	656	656	656	531	531	531	531	420	420	118	918	918	918	918	918	918	757	
39.3	Hardened steel	Vc	21	21	21	21	19	19	19	16	16	6	31	31	31	31	31	31	28		
		fz	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008	0.007	0.007	0.005	0.011	0.011	0.011	0.011	0.011	0.010		
		RPM	32786	32786	32786	32786	29507	29507	29507	29507	26229	26229	9836	32786	32786	32786	32786	32786	32786	29507	
		FEED	590	590	590	590	472	472	472	472	367	367	98	721	721	721	721	721	721	590	
40	Chilled Cast Iron	Vc	31	31	31	31	28	28	28	25	25	9	46	46	46	46	46	46	42		
		fz	0.011	0.011	0.011	0.011	0.010	0.010	0.010	0.010	0.009	0.009	0.007	0.014	0.014	0.014	0.014	0.014	0.013		
		RPM	49178	49178	49178	49178	44260	44260	44260	44260	39342	39342	14753	49178	49178	49178	49178	49178	49178	44260	
		FEED	1082	1082	1082	1082	885	885	885	885	708	708	207	1377	1377	1377	1377	1377	1377	1151	
41	Hardened Cast Iron	Vc	29	29	29	29	26	26	26	23	23	9	41	41	41	41	41	41	37		
		fz	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.008	0.008	0.006	0.013	0.013	0.013	0.013	0.013	0.012		
		RPM	45900	45900	45900	45900	41310	41310	41310	41310	36720	36720	13770	43714	43714	43714	43714	43714	43714	39343	
		FEED	918	918	918	918	744	744	744	744	588	588	165	1137	1137	1137	1137	1137	1137	944	

NEXT PAGE ▶

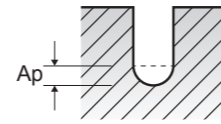
### HPI91, HPI92 SERIES 2 FLUTE BALL NOSE for RIB PROCESSING



Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev/min. FEED = mm/min. LBS = Length Below Shank

VDI 3323	Parameter	Diameter (Ø)																						
		0.3		0.3		0.3		0.3		0.3		0.3		0.4		0.4		0.4		0.4				
		L.B.S	2.25	2.5	3	3.5	4	5	7	0.5	0.8	1	1.5	2	2.5	3	3.5	4	4.5	5	6	7	1	
5	Vc	42	42	42	42	37	37	28	14	67	67	67	67	60	60	60	60	54	54	54	40	82		
		fz	0.014	0.014	0.014	0.014	0.012	0.012	0.011	0.009	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.015	0.015	0.015	0.013	0.024	
		RPM	44260	44260	44260	44260	39342	39342	29507	14753	53277	53277	53277	53277	47949	47949	47949	47949	42622	42622	42622	31966	52458	
		FEED	1239	1239	1239	1239	944	944	649	266	2025	2025	2025	2025	1630	1630	1630	1630	1279	1279	1279	831	2518	
	8-9	Vc	42	42	42	42	37	37	28	14	67	67	67	67	60	60	60	60	54	54	54	40	82	
			fz	0.014	0.014	0.014	0.014	0.012	0.012	0.011	0.009	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.015	0.015	0.015	0.013	0.024
			RPM	44260	44260	44260	44260	39342	39342	29507	14753	53277	53277	53277	53277	47949	47949	47949	47949	42622	42622	42622	31966	52458
			FEED	1239	1239	1239	1239	944	944	649	266	2025	2025	2025	2025	1630	1630	1630	1630	1279	1279	1279	831	2518
	11.1	Vc	42	42	42	42	37	37	28	14	67	67	67	67	60	60	60	60	54	54	54	40	82	
			fz	0.014	0.014	0.014	0.014	0.012	0.012	0.011	0.009	0.019	0.019	0.019	0.019	0.017	0.017	0.017	0.017	0.015	0.015	0.015	0.013	0.024
			RPM	44260	44260	44260	44260	39342	39342	29507	14753	53277	53277	53277	53277	47949	47949	47949	47949	42622	42622	42622	31966	52458
			FEED	1239	1239	1239	1239	944	944	649	266	2025	2025	2025	2025	1630	1630	1630	1630	1279	1279	1279	831	2518
11.2	Vc	42	42	42	42	37	37	28	14	67	67	67	67	60	60	60	60	54	54	54	40	82		
		fz	0.013	0.013	0.013	0.013	0.011	0.011	0.010	0.008	0.017	0.017	0.017	0.017	0.015	0.015	0.015	0.015	0.014	0.014	0.014	0.012	0.021	
		RPM	44260	44260	44260	44260	39342	39342	29507	14753	53277	53277	53277											





Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

**HPI91, HPI92 SERIES**

**2 FLUTE BALL NOSE for RIB PROCESSING**

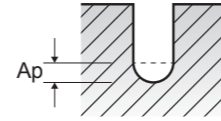
ISO	VDI 3323	Parameter LBS	Diameter (Ø)																				
			0.9 4	0.9 6	0.9 8	1 2	1 2.5	1 3	1 4	1 5	1 6	1 7	1 8	1 9	1 10	1 12	1 13	1 14	1 16	1 18	1 20	1 22	1 25
P	5	Vc	145	130	130	160	160	160	160	144	144	144	144	144	128	128	128	96	96	96	48	48	
		fz	0.039	0.035	0.035	0.048	0.048	0.048	0.048	0.043	0.043	0.043	0.043	0.043	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	
		RPM	51228	46105	46105	50818	50818	50818	50818	45736	45736	45736	45736	45736	40654	40654	40654	30491	30491	30491	15245	15245	
		FEED	3996	3227	3227	4879	4879	4879	4879	3933	3933	3933	3933	3933	3090	3090	3090	2073	2073	2073	884	884	
	Ap	0.016	0.014	0.013	0.020	0.020	0.020	0.018	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.010	0.010	0.005	0.005	
	8-9	Vc	145	130	130	160	160	160	160	144	144	144	144	144	128	128	128	96	96	96	48	48	
		fz	0.039	0.035	0.035	0.048	0.048	0.048	0.048	0.043	0.043	0.043	0.043	0.043	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	
		RPM	51228	46105	46105	50818	50818	50818	50818	45736	45736	45736	45736	45736	40654	40654	40654	30491	30491	30491	15245	15245	
		FEED	3996	3227	3227	4879	4879	4879	4879	3933	3933	3933	3933	3933	3090	3090	3090	2073	2073	2073	884	884	
	Ap	0.016	0.014	0.013	0.020	0.020	0.020	0.018	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.010	0.010	0.005	0.005	
	11.1	Vc	145	130	130	160	160	160	160	144	144	144	144	144	128	128	128	96	96	96	48	48	
		fz	0.039	0.035	0.035	0.048	0.048	0.048	0.048	0.043	0.043	0.043	0.043	0.043	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	
RPM		51228	46105	46105	50818	50818	50818	50818	45736	45736	45736	45736	45736	40654	40654	40654	30491	30491	30491	15245	15245		
FEED		3996	3227	3227	4879	4879	4879	4879	3933	3933	3933	3933	3933	3090	3090	3090	2073	2073	2073	884	884		
Ap	0.016	0.014	0.013	0.020	0.020	0.020	0.018	0.016	0.016	0.016	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.010	0.010	0.005	0.005		
11.2	Vc	145	130	130	160	160	160	160	144	144	144	144	144	128	128	128	96	96	96	48	48		
	fz	0.033	0.030	0.030	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	0.029	0.025	0.025		
	RPM	51228	46105	46105	50818	50818	50818	50818	45736	45736	45736	45736	45736	40654	40654	40654	30491	30491	30491	15245	15245		
	FEED	3381	2766	2766	4269	4269	4269	4269	3476	3476	3476	3476	3476	2764	2764	2764	1768	1768	1768	762	762		
Ap	0.014	0.012	0.011	0.017	0.017	0.017	0.015	0.014	0.014	0.014	0.012	0.012	0.012	0.012	0.011	0.011	0.009	0.009	0.004	0.004			
H	38.1	Vc	145	130	130	160	160	160	160	144	144	144	144	144	128	128	128	96	96	96	48	48	
		fz	0.033	0.030	0.030	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	0.029	0.025	0.025	
		RPM	51228	46105	46105	50818	50818	50818	50818	45736	45736	45736	45736	45736	40654	40654	40654	30491	30491	30491	15245	15245	
		FEED	3381	2766	2766	4269	4269	4269	4269	3476	3476	3476	3476	3476	2764	2764	2764	1768	1768	1768	762	762	
	Ap	0.014	0.012	0.011	0.017	0.017	0.017	0.015	0.014	0.014	0.014	0.012	0.012	0.012	0.011	0.011	0.011	0.009	0.009	0.004	0.004		
	38.2	Vc	133	120	120	144	144	144	144	130	130	130	130	130	115	115	115	87	87	87	43	43	
		fz	0.033	0.030	0.030	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	0.029	0.025	0.025	
		RPM	47130	42417	42417	45900	45900	45900	45900	41310	41310	41310	41310	41310	36720	36720	36720	27540	27540	27540	13770	13770	
		FEED	3111	2545	2545	3856	3856	3856	3856	3140	3140	3140	3140	3140	2497	2497	2497	1597	1597	1597	689	689	
	Ap	0.014	0.012	0.011	0.017	0.017	0.017	0.015	0.014	0.014	0.014	0.012	0.012	0.012	0.011	0.011	0.011	0.009	0.009	0.004	0.004		
	39.1	Vc	116	104	104	129	129	129	129	116	116	116	116	116	103	103	103	77	77	77	39	39	
		fz	0.030	0.027	0.027	0.038	0.038	0.038	0.038	0.034	0.034	0.034	0.034	0.034	0.030	0.030	0.030	0.027	0.027	0.027	0.023	0.023	
RPM		40983	36885	36885	40983	40983	40983	40983	36885	36885	36885	36885	36885	32786	32786	32786	24590	24590	24590	12295	12295		
FEED		2459	1992	1992	3115	3115	3115	3115	2508	2508	2508	2508	2508	1967	1967	1967	1328	1328	1328	566	566		
Ap	0.013	0.012	0.010	0.016	0.016	0.016	0.014	0.013	0.013	0.013	0.011	0.011	0.011	0.011	0.010	0.010	0.008	0.008	0.004	0.004			
39.2	Vc	104	94	94	113	113	113	113	102	102	102	102	102	91	91	91	68	68	68	34	34		
	fz	0.030	0.027	0.027	0.037	0.037	0.037	0.037	0.033	0.033	0.033	0.033	0.033	0.030	0.030	0.030	0.026	0.026	0.026	0.022	0.022		
	RPM	36884	33196	33196	36064	36064	36064	36064	32458	32458	32458	32458	32458	28851	28851	28851	21638	21638	21638	10819	10819		
	FEED	2213	1793	1793	2669	2669	2669	2669	2142	2142	2142	2142	2142	1731	1731	1731	1125	1125	1125	476	476		
Ap	0.013	0.012	0.010	0.016	0.016	0.016	0.014	0.013	0.013	0.013	0.011	0.011	0.011	0.011	0.010	0.010	0.008	0.008	0.004	0.004			
39.3	Vc	93	83	83	113	113	113	113	102	102	102	102	102	91	91	91	68	68	68	34	34		
	fz	0.029	0.026	0.026	0.033	0.033	0.033	0.033	0.030	0.030	0.030	0.030	0.030	0.026	0.026	0.026	0.023	0.023	0.023	0.020	0.020		
	RPM	32786	29507	29507	36064	36064	36064	36064	32458	32458	32458	32458	32458	28851	28851	28851	21638	21638	21638	10819	10819		
	FEED	1902	1534	1534	2380	2380	2380	2380	1947	1947	1947	1947	1947	1500	1500	1500	995	995	995	433	433		
Ap	0.011	0.009	0.008	0.013	0.013	0.013	0.012	0.010	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.003	0.003			
40	Vc	145	130	130	160	160	160	160	144	144	144	144	144	128	128	128	96	96	96	48	48		
	fz	0.033	0.030	0.030	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	0.029	0.025	0.025		
	RPM	51228	46105	46105	50818	50818	50818	50818	45736	45736	45736	45736	45736	40654	40654	40654	30491	30491	30491	15245	15245		
	FEED	3381	2766	2766	4269	4269	4269	4269	3476	3476	3476	3476	3476	2764	2764	2764	1768	1768	1768	762	762		
Ap	0.014	0.012	0.011	0.017	0.017	0.017	0.015	0.014	0.014	0.014	0.012	0.012	0.012	0.011	0.011	0.011	0.009	0.009	0.004	0.004			
41	Vc	133	120	120	144	144	144	144	130	130	130	130	130	115	115	115	87	87	87	43	43		
	fz	0.033	0.030	0.030	0.042	0.042	0.042	0.042	0.038	0.038	0.038	0.038	0.038	0.034	0.034	0.034	0.029	0.029	0.029	0.025	0.025		
	RPM	47130	42417	42417	45900	45900	45900	45900	41310	41310	41310	41310	41310	36720	36720	36720	27540	27540	27540	13770	13770		
	FEED	3111	2545	2545	3856	3856	3856	3856	3140	3140	3140	3140	3140	2497	2497	2497	1597	1597	1597	689	689		
Ap	0.014	0.012	0.011	0.017	0.017	0.017	0.015	0.014	0.014	0.014	0.012	0.012	0.012	0.011	0.011	0.011	0.009	0.009	0.004	0.004			

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## HPI91, HPI92 SERIES

## 2 FLUTE BALL NOSE for RIB PROCESSING

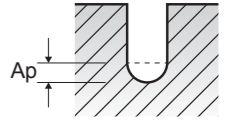
Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Parameter	Diameter (Ø)																					
			1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	2	2	2	2	2	2	2	2	2	2			
L.B.S			18	20	22	25	30	8	12	16	20	3	4	6	8	10	12	13	14	16	18	20	22	
P	5	Vc	194	194	194	145	145	258	232	232	206	319	319	319	319	319	287	287	287	287	287	287	255	
		fz	0.043	0.043	0.043	0.038	0.038	0.055	0.050	0.050	0.044	0.057	0.057	0.057	0.057	0.057	0.051	0.051	0.051	0.051	0.051	0.051	0.046	
		RPM	41092	41092	41092	30819	30819	51228	46105	46105	40982	50818	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	45736	40654
		FEED	3534	3534	3534	2342	2342	5635	4611	4611	3606	5793	5793	5793	5793	5793	5793	4665	4665	4665	4665	4665	4665	3740
	Ap	0.021	0.020	0.020	0.015	0.015	0.029	0.026	0.022	0.022	0.040	0.040	0.040	0.036	0.036	0.032	0.032	0.032	0.032	0.032	0.028	0.028	0.028	
	8-9	Vc	194	194	194	145	145	258	232	232	206	319	319	319	319	319	287	287	287	287	287	287	255	
		fz	0.043	0.043	0.043	0.038	0.038	0.055	0.050	0.050	0.044	0.057	0.057	0.057	0.057	0.057	0.051	0.051	0.051	0.051	0.051	0.051	0.046	
		RPM	41092	41092	41092	30819	30819	51228	46105	46105	40982	50818	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	45736	40654
		FEED	3534	3534	3534	2342	2342	5635	4611	4611	3606	5793	5793	5793	5793	5793	5793	4665	4665	4665	4665	4665	4665	3740
	11.1	Vc	194	194	194	145	145	258	232	232	206	319	319	319	319	319	287	287	287	287	287	287	255	
		fz	0.043	0.043	0.043	0.038	0.038	0.055	0.050	0.050	0.044	0.057	0.057	0.057	0.057	0.057	0.051	0.051	0.051	0.051	0.051	0.051	0.046	
		RPM	41092	41092	41092	30819	30819	51228	46105	46105	40982	50818	50818	50818	50818	50818	50818	45736	45736	45736	45736	45736	45736	40654
FEED		3534	3534	3534	2342	2342	5635	4611	4611	3606	5793	5793	5793	5793	5793	5793	4665	4665	4665	4665	4665	4665	3740	
11.2	Vc	185	185	185	139	139	247	222	222	198	309	309	309	309	309	278	278	278	278	278	278	247		
	fz	0.038	0.038	0.038	0.033	0.033	0.048	0.043	0.043	0.038	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.045	0.040		
	RPM	39342	39342	39342	29507	29507	49178	44260	44260	39342	49178	49178	49178	49178	49178	44260	44260	44260	44260	44260	44260	39342		
	FEED	2990	2990	2990	1947	1947	4721	3806	3806	2990	4918	4918	4918	4918	4918	3983	3983	3983	3983	3983	3983	3147		
H	38.1	Vc	185	185	185	139	139	247	222	222	198	309	309	309	309	309	278	278	278	278	278	247		
		fz	0.038	0.038	0.038	0.033	0.033	0.048	0.043	0.043	0.038	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.040		
		RPM	39342	39342	39342	29507	29507	49178	44260	44260	39342	49178	49178	49178	49178	49178	44260	44260	44260	44260	44260	44260	39342	
		FEED	2990	2990	2990	1947	1947	4721	3806	3806	2990	4918	4918	4918	4918	4918	3983	3983	3983	3983	3983	3983	3147	
	38.2	Vc	169	169	169	127	127	225	202	202	180	258	258	258	258	258	232	232	232	232	232	232	206	
		fz	0.038	0.038	0.038	0.033	0.033	0.048	0.043	0.043	0.038	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.045	0.040	
		RPM	35846	35846	35846	26884	26884	44671	40204	40204	35737	40983	40983	40983	40983	40983	36885	36885	36885	36885	36885	36885	32786	
		FEED	2724	2724	2724	1774	1774	4288	3458	3458	2716	4098	4098	4098	4098	4098	3320	3320	3320	3320	3320	3320	2623	
	39.1	Vc	144	144	144	108	108	192	172	172	153	227	227	227	227	227	204	204	204	204	204	204	181	
		fz	0.034	0.034	0.034	0.029	0.029	0.043	0.039	0.039	0.034	0.045	0.045	0.045	0.045	0.045	0.041	0.041	0.041	0.041	0.041	0.041	0.036	
		RPM	30600	30600	30600	22950	22950	38114	34303	34303	30491	36064	36064	36064	36064	36064	32458	32458	32458	32458	32458	32458	28851	
		FEED	2081	2081	2081	1331	1331	3278	2676	2676	2073	3246	3246	3246	3246	3246	2662	2662	2662	2662	2662	2662	2077	
39.2	Vc	128	128	128	96	96	170	153	153	136	206	206	206	206	206	185	185	185	185	185	185	165		
	fz	0.033	0.033	0.033	0.029	0.029	0.043	0.039	0.039	0.034	0.044	0.044	0.044	0.044	0.044	0.040	0.040	0.040	0.040	0.040	0.040	0.035		
	RPM	27103	27103	27103	20327	20327	33811	30430	30430	27049	32786	32786	32786	32786	32786	29507	29507	29507	29507	29507	29507	26229		
	FEED	1789	1789	1789	1179	1179	2908	2374	2374	1839	2885	2885	2885	2885	2885	2361	2361	2361	2361	2361	2361	1836		
39.3	Vc	115	115	115	87	87	153	138	138	123	185	185	185	185	185	167	167	167	167	167	167	148		
	fz	0.031	0.031	0.031	0.027	0.027	0.039	0.035	0.035	0.031	0.040	0.040	0.040	0.040	0.040	0.036	0.036	0.036	0.036	0.036	0.036	0.032		
	RPM	24480	24480	24480	18360	18360	30532	27479	27479	24426	29507	29507	29507	29507	29507	26556	26556	26556	26556	26556	26556	23606		
	FEED	1518	1518	1518	991	991	2381	1924	1924	1514	2361	2361	2361	2361	2361	1912	1912	1912	1912	1912	1912	1511		
40	Vc	185	185	185	139	139	247	222	222	198	309	309	309	309	309	278	278	278	278	278	278	247		
	fz	0.038	0.038	0.038	0.033	0.033	0.048	0.043	0.043	0.038	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.045	0.040		
	RPM	39342	39342	39342	29507	29507	49178	44260	44260	39342	49178	49178	49178	49178	49178	44260	44260	44260	44260	44260	44260	39342		
	FEED	2990	2990	2990	1947	1947	4721	3806	3806	2990	4918	4918	4918	4918	4918	3983	3983	3983	3983	3983	3983	3147		
41	Vc	169	169	169	127	127	225	202	202	180	258	258	258	258	258	232	232	232	232	232	232	206		
	fz	0.038	0.038	0.038	0.033	0.033	0.048	0.043	0.043	0.038	0.050	0.050	0.050	0.050	0.050	0.045	0.045	0.045	0.045	0.045	0.045	0.040		
	RPM	35846	35846	35846	26884	26884	44671	40204	40204	35737	40983	40983	40983	40983	40983	36885	36885	36885	36885	36885	36885	32786		
	FEED	2724	2724	2724	1774	1774	4288	3458	3458	2716	4098	4098	4098	4098	4098	3320	3320	3320	3320	3320	3320	2623		

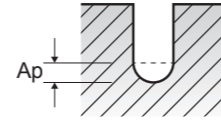
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## HPI91, HPI92 SERIES

## 2 FLUTE BALL NOSE for RIB PROCESSING

Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

VDI 3323	Parameter	Diameter (Ø)																					
		2	2	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	3	3	3	3			
L.B.S		25	30	35	40	50	6	8	10	15	20	25	30	35	6	8	10	12	14	15	16	20	25
5	Vc	255	255	192	192	96	320	320	320	288	288	288	256	256	319	319	319	319	319	319	287	287	287
	fz	0.046	0.046	0.040	0.040	0.034	0.074	0.074	0.074	0.066	0.066	0.066	0.059	0.059	0.091	0.091	0.091	0.091	0.091	0.091	0.082	0.082	0.082
	RPM	40654	40654	30491	30491	15245	40685	40685	40685	36617	36617	36617	32548	32548	33879	33879	33879	33879	33879	33879	30491	30491	30491
	FEED	3740	3740	2439	2439	1037	6021	6021	6021	4833	4833	4833	3841	3841	6166	6166	6166	6166	6166	6166	5001	5001	5001
8-9	Vc	255	255	192	192	96	320	320	320	288	288	288	256	256	319	319	319	319	319	319	287	287	287
	fz	0.046	0.046	0.040	0.040	0.034	0.074	0.074	0.074	0.066	0.066	0.066	0.059	0.059	0.091	0.091	0.091	0.091	0.091	0.091	0.082	0.082	0.082
	RPM	40654	40654	30491	30491</																		

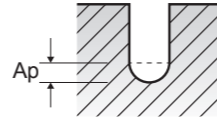


Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

**HPI91, HPI92** SERIES

**2 FLUTE BALL NOSE for RIB PROCESSING**

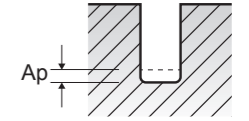
ISO	VDI 3323	Parameter L.B.S	Diameter (Ø)																																	
			3 30	3 35	3 40	3 50	3.5 15	3.5 20	3.5 25	3.5 30	3.5 35	3.5 40	3.5 45	4 8	4 10	4 12	4 14	4 15	4 20	4 25	4 30	4 35	4 40	4 45	4 50	4 55	4 60	4 65	4 70	4 75	4 80	4 85	4 90	4 95	4 100	
P	5	Vc	287	255	255	192	324	292	292	292	292	260	260	324	324	324	324	324	324	292	292	292	292	260	260	324	324	324	324	324	324	324	292	292	292	292
		fz	0.082	0.073	0.073	0.064	0.105	0.094	0.094	0.094	0.094	0.084	0.084	0.120	0.120	0.120	0.120	0.120	0.120	0.108	0.108	0.108	0.108	0.084	0.084	0.120	0.120	0.120	0.120	0.120	0.120	0.108	0.108	0.108	0.108	
		RPM	30491	27103	27103	20327	29510	26559	26559	26559	26559	23608	23608	25819	25819	25819	25819	25819	25819	25819	23237	23237	23237	23237	23608	23608	25819	25819	25819	25819	25819	23237	23237	23237	23237	
		FEED	5001	3957	3957	2602	6197	4993	4993	4993	4993	3966	3966	6197	6197	6197	6197	6197	6197	6197	5019	5019	5019	5019	3966	3966	6197	6197	6197	6197	6197	5019	5019	5019	5019	
	Ap	0.042	0.042	0.039	0.030	0.063	0.056	0.056	0.049	0.049	0.049	0.049	0.080	0.080	0.080	0.072	0.072	0.072	0.072	0.064	0.064	0.056	0.056	0.049	0.049	0.080	0.080	0.080	0.072	0.072	0.064	0.064	0.056	0.056		
	8-9	Vc	287	255	255	192	324	292	292	292	292	260	260	324	324	324	324	324	324	292	292	292	292	260	260	324	324	324	324	324	324	292	292	292	292	
		fz	0.082	0.073	0.073	0.064	0.105	0.094	0.094	0.094	0.094	0.084	0.084	0.120	0.120	0.120	0.120	0.120	0.120	0.108	0.108	0.108	0.108	0.084	0.084	0.120	0.120	0.120	0.120	0.120	0.108	0.108	0.108	0.108		
		RPM	30491	27103	27103	20327	29510	26559	26559	26559	26559	23608	23608	25819	25819	25819	25819	25819	25819	25819	23237	23237	23237	23237	23608	23608	25819	25819	25819	25819	25819	23237	23237	23237	23237	
		FEED	5001	3957	3957	2602	6197	4993	4993	4993	4993	3966	3966	6197	6197	6197	6197	6197	6197	6197	5019	5019	5019	5019	3966	3966	6197	6197	6197	6197	6197	5019	5019	5019	5019	
	Ap	0.042	0.042	0.039	0.030	0.063	0.056	0.056	0.049	0.049	0.049	0.049	0.080	0.080	0.080	0.072	0.072	0.072	0.072	0.064	0.064	0.056	0.056	0.049	0.049	0.080	0.080	0.080	0.072	0.072	0.064	0.064	0.056	0.056		
	11.1	Vc	287	255	255	192	324	292	292	292	292	260	260	324	324	324	324	324	324	292	292	292	292	260	260	324	324	324	324	324	324	292	292	292	292	
		fz	0.082	0.073	0.073	0.064	0.105	0.094	0.094	0.094	0.094	0.084	0.084	0.120	0.120	0.120	0.120	0.120	0.120	0.108	0.108	0.108	0.108	0.084	0.084	0.120	0.120	0.120	0.120	0.120	0.108	0.108	0.108	0.108		
RPM		30491	27103	27103	20327	29510	26559	26559	26559	26559	23608	23608	25819	25819	25819	25819	25819	25819	25819	23237	23237	23237	23237	23608	23608	25819	25819	25819	25819	25819	23237	23237	23237	23237		
FEED		5001	3957	3957	2602	6197	4993	4993	4993	4993	3966	3966	6197	6197	6197	6197	6197	6197	6197	5019	5019	5019	5019	3966	3966	6197	6197	6197	6197	6197	5019	5019	5019	5019		
Ap	0.042	0.042	0.039	0.030	0.063	0.056	0.056	0.049	0.049	0.049	0.049	0.080	0.080	0.080	0.072	0.072	0.072	0.072	0.064	0.064	0.056	0.056	0.049	0.049	0.080	0.080	0.080	0.072	0.072	0.064	0.064	0.056	0.056			
11.2	Vc	278	247	247	185	309	278	278	278	278	247	247	309	309	309	309	309	309	278	278	278	278	247	247	309	309	309	309	309	278	278	278	278			
	fz	0.075	0.066	0.066	0.058	0.097	0.087	0.087	0.087	0.087	0.078	0.078	0.111	0.111	0.111	0.111	0.111	0.111	0.100	0.100	0.100	0.100	0.078	0.078	0.111	0.111	0.111	0.111	0.111	0.100	0.100	0.100	0.100			
	RPM	29507	26229	26229	19672	28068	25261	25261	25261	25261	22454	22454	24589	24589	24589	24589	24589	24589	24589	22130	22130	22130	22130	22454	22454	24589	24589	24589	24589	24589	22130	22130	22130	22130		
	FEED	4426	3462	3462	2282	5445	4395	4395	4395	4395	3503	3503	5459	5459	5459	5459	5459	5459	5459	4426	4426	4426	4426	3503	3503	5459	5459	5459	5459	5459	4426	4426	4426	4426		
Ap	0.036	0.036	0.033	0.026	0.054	0.048	0.048	0.042	0.042	0.042	0.042	0.068	0.068	0.068	0.061	0.061	0.061	0.061	0.054	0.054	0.048	0.048	0.042	0.042	0.068	0.068	0.068	0.061	0.061	0.054	0.054	0.048	0.048			
H	38.1	Vc	278	247	247	185	309	278	278	278	278	247	247	309	309	309	309	309	278	278	278	278	247	247	309	309	309	309	309	278	278	278	278			
		fz	0.075	0.066	0.066	0.058	0.097	0.087	0.087	0.087	0.087	0.078	0.078	0.111	0.111	0.111	0.111	0.111	0.111	0.100	0.100	0.100	0.100	0.078	0.078	0.111	0.111	0.111	0.111	0.100	0.100	0.100	0.100			
		RPM	29507	26229	26229	19672	28068	25261	25261	25261	25261	22454	22454	24589	24589	24589	24589	24589	24589	24589	22130	22130	22130	22130	22454	22454	24589	24589	24589	24589	24589	22130	22130	22130	22130	
		FEED	4426	3462	3462	2282	5445	4395	4395	4395	4395	3503	3503	5459	5459	5459	5459	5459	5459	5459	4426	4426	4426	4426	3503	3503	5459	5459	5459	5459	5459	4426	4426	4426	4426	
	Ap	0.036	0.036	0.033	0.026	0.054	0.048	0.048	0.042	0.042	0.042	0.042	0.068	0.068	0.068	0.061	0.061	0.061	0.061	0.054	0.054	0.048	0.048	0.042	0.042	0.068	0.068	0.068	0.061	0.061	0.054	0.054	0.048	0.048		
	38.2	Vc	232	206	206	155	258	232	232	232	232	206	206	257	257	257	257	257	257	232	232	232	232	206	206	257	257	257	257	257	232	232	232	232		
		fz	0.068	0.060	0.060	0.053	0.087	0.079	0.079	0.079	0.079	0.070	0.070	0.100	0.100	0.100	0.100	0.100	0.100	0.090	0.090	0.090	0.090	0.070	0.070	0.100	0.100	0.100	0.100	0.100	0.090	0.090	0.090	0.090		
		RPM	24590	21858	21858	16393	23433	21090	21090	21090	21090	18746	18746	20491	20491	20491	20491	20491	20491	20491	18442	18442	18442	18442	18746	18746	20491	20491	20491	20491	20491	18442	18442	18442	18442	
		FEED	3344	2623	2623	1738	4077	3332	3332	3332	3332	2624	2624	4098	4098	4098	4098	4098	4098	4098	3320	3320	3320	3320	2624	2624	4098	4098	4098	4098	4098	3320	3320	3320	3320	
	Ap	0.036	0.036	0.033	0.026	0.054	0.048	0.048	0.042	0.042	0.042	0.042	0.068	0.068	0.068	0.061	0.061	0.061	0.061	0.054	0.054	0.048	0.048	0.042	0.042	0.068	0.068	0.068	0.061	0.061	0.054	0.054	0.048	0.048		
	39.1	Vc	204	181	181	136	227	204	204	204	204	181	181	227	227	227	227	227	227	204	204	204	204	181	181	227	227	227	227	227	204	204	204	204		
		fz	0.060	0.054	0.054	0.047	0.079	0.071	0.071	0.071	0.071	0.063	0.063	0.090	0.090	0.090	0.090	0.090	0.090	0.081	0.081	0.081	0.081	0.063	0.063	0.090	0.090	0.090	0.090	0.090	0.081	0.081	0.081	0.081		
RPM		21639	19234	19234	14426	20600	18540	18540	18540	18540	16480	16480	18032	18032	18032	18032	18032	18032	18032	16229	16229	16229	16229	16480	16480	18032	18032	18032	18032	18032	16229	16229	16229	16229		
FEED		2597	2077	2077	1356	3255	2633	2633	2633	2633	2076	2076	3246	3246	3246	3246	3246	3246	3246	2629	2629	2629	2629	2076	2076	3246	3246	3246	3246	3246	2629	2629	2629	2629		
Ap	0.034	0.034	0.031	0.024	0.050	0.045	0.045	0.039	0.039	0.039	0.039	0.064	0.064	0.064	0.058	0.058	0.058	0.058	0.051	0.051	0.045	0.045	0.039	0.039	0.064	0.064	0.064	0.058	0.058	0.051	0.051	0.045	0.045			
39.2	Vc	185	165	165	124	206	186	186	186	186	165	165	206	206	206	206	206																			



Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

### HPI91, HPI92 SERIES 2 FLUTE BALL NOSE for RIB PROCESSING

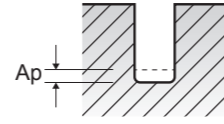
ISO	VDI 3323	Parameter LBS	Diameter (Ø)																			
			8 35	8 50	8 55	8 60	8 70	8 80	8 98	8 120	10 35	10 55	10 60	10 65	10 75	10 86	10 120	12 60	12 80	12 106	12 120	
P	5	Vc	288	260	260	260	260	260	231	231	299	269	269	269	269	269	239	268	241	241	241	241
		fz	0.189	0.170	0.170	0.170	0.170	0.170	0.151	0.151	0.199	0.179	0.179	0.179	0.179	0.179	0.159	0.212	0.191	0.191	0.191	0.191
		RPM	11475	10328	10328	10328	10328	10328	9180	9180	9508	8557	8557	8557	8557	8557	7606	7104	6394	6394	6394	6394
		FEED	4338	3512	3512	3512	3512	3512	2772	2772	3784	3063	3063	3063	3063	3063	2419	3012	2443	2443	2443	2443
	Ap	0.144	0.128	0.128	0.128	0.112	0.112	0.104	0.180	0.160	0.160	0.160	0.160	0.160	0.140	0.140	0.216	0.192	0.168	0.168	0.168	
	8-9	Vc	288	260	260	260	260	231	231	299	269	269	269	269	269	239	268	241	241	241	241	241
		fz	0.189	0.170	0.170	0.170	0.170	0.151	0.151	0.199	0.179	0.179	0.179	0.179	0.179	0.159	0.212	0.191	0.191	0.191	0.191	0.191
		RPM	11475	10328	10328	10328	10328	9180	9180	9508	8557	8557	8557	8557	8557	7606	7104	6394	6394	6394	6394	6394
		FEED	4338	3512	3512	3512	3512	2772	2772	3784	3063	3063	3063	3063	3063	2419	3012	2443	2443	2443	2443	2443
	Ap	0.144	0.128	0.128	0.128	0.112	0.112	0.104	0.180	0.160	0.160	0.160	0.160	0.160	0.140	0.140	0.216	0.192	0.168	0.168	0.168	
	11.1	Vc	288	260	260	260	260	231	231	299	269	269	269	269	269	239	268	241	241	241	241	241
		fz	0.189	0.170	0.170	0.170	0.170	0.151	0.151	0.199	0.179	0.179	0.179	0.179	0.179	0.159	0.212	0.191	0.191	0.191	0.191	0.191
RPM		11475	10328	10328	10328	10328	9180	9180	9508	8557	8557	8557	8557	8557	7606	7104	6394	6394	6394	6394	6394	
FEED		4338	3512	3512	3512	3512	2772	2772	3784	3063	3063	3063	3063	3063	2419	3012	2443	2443	2443	2443	2443	
Ap	0.144	0.128	0.128	0.128	0.112	0.112	0.104	0.180	0.160	0.160	0.160	0.160	0.160	0.140	0.140	0.216	0.192	0.168	0.168	0.168		
11.2	Vc	278	250	250	250	250	222	222	288	260	260	260	260	260	231	257	232	232	232	232	232	
	fz	0.164	0.148	0.148	0.148	0.148	0.131	0.131	0.174	0.157	0.157	0.157	0.157	0.157	0.139	0.187	0.168	0.168	0.168	0.168	0.168	
	RPM	11065	9959	9959	9959	9959	8852	8852	9180	8262	8262	8262	8262	8262	7344	6830	6147	6147	6147	6147	6147	
	FEED	3629	2948	2948	2948	2948	2319	2319	3195	2594	2594	2594	2594	2594	2042	2554	2065	2065	2065	2065	2065	
Ap	0.122	0.109	0.109	0.109	0.095	0.095	0.088	0.153	0.136	0.136	0.136	0.136	0.136	0.119	0.119	0.184	0.163	0.143	0.143	0.143		
H	38.1	Vc	278	250	250	250	250	222	222	288	260	260	260	260	260	231	257	232	232	232	232	
		fz	0.164	0.148	0.148	0.148	0.148	0.131	0.131	0.174	0.157	0.157	0.157	0.157	0.157	0.139	0.187	0.168	0.168	0.168	0.168	
		RPM	11065	9959	9959	9959	9959	8852	8852	9180	8262	8262	8262	8262	8262	7344	6830	6147	6147	6147	6147	6147
		FEED	3629	2948	2948	2948	2948	2319	2319	3195	2594	2594	2594	2594	2594	2042	2554	2065	2065	2065	2065	2065
	Ap	0.122	0.109	0.109	0.109	0.095	0.095	0.088	0.153	0.136	0.136	0.136	0.136	0.136	0.119	0.119	0.184	0.163	0.143	0.143	0.143	
	38.2	Vc	232	209	209	209	209	185	185	242	218	218	218	218	218	194	216	195	195	195	195	195
		fz	0.150	0.135	0.135	0.135	0.135	0.120	0.120	0.160	0.144	0.144	0.144	0.144	0.144	0.128	0.170	0.153	0.153	0.153	0.153	
		RPM	9221	8299	8299	8299	8299	7377	7377	7704	6934	6934	6934	6934	6934	6163	5737	5163	5163	5163	5163	5163
		FEED	2766	2241	2241	2241	2241	1770	1770	2465	1997	1997	1997	1997	1997	1578	1951	1580	1580	1580	1580	1580
	Ap	0.122	0.109	0.109	0.109	0.095	0.095	0.088	0.153	0.136	0.136	0.136	0.136	0.136	0.119	0.119	0.184	0.163	0.143	0.143	0.143	
	39.1	Vc	206	185	185	185	185	165	165	211	190	190	190	190	190	169	196	176	176	176	176	176
		fz	0.134	0.121	0.121	0.121	0.121	0.107	0.107	0.144	0.130	0.130	0.130	0.130	0.130	0.115	0.155	0.140	0.140	0.140	0.140	
RPM		8197	7377	7377	7377	7377	6558	6558	6721	6049	6049	6049	6049	6049	5377	5191	4672	4672	4672	4672	4672	
FEED		2197	1785	1785	1785	1785	1403	1403	1936	1573	1573	1573	1573	1573	1237	1609	1308	1308	1308	1308	1308	
Ap	0.115	0.102	0.102	0.102	0.090	0.090	0.083	0.144	0.128	0.128	0.128	0.128	0.128	0.112	0.112	0.173	0.154	0.134	0.134	0.134		
39.2	Vc	180	162	162	162	162	144	144	185	167	167	167	167	167	148	170	153	153	153	153	153	
	fz	0.132	0.119	0.119	0.119	0.119	0.106	0.106	0.142	0.128	0.128	0.128	0.128	0.128	0.114	0.142	0.128	0.128	0.128	0.128	0.128	
	RPM	7172	6455	6455	6455	6455	5738	5738	5902	5312	5312	5312	5312	5312	4722	4508	4057	4057	4057	4057	4057	
	FEED	1893	1536	1536	1536	1536	1216	1216	1676	1360	1360	1360	1360	1360	1077	1280	1039	1039	1039	1039	1039	
Ap	0.115	0.102	0.102	0.102	0.090	0.090	0.083	0.144	0.128	0.128	0.128	0.128	0.128	0.112	0.112	0.173	0.154	0.134	0.134	0.134		
39.3	Vc	170	153	153	153	153	136	136	170	153	153	153	153	153	136	154	139	139	139	139	139	
	fz	0.119	0.107	0.107	0.107	0.107	0.095	0.095	0.130	0.117	0.117	0.117	0.117	0.117	0.104	0.131	0.118	0.118	0.118	0.118	0.118	
	RPM	6762	6086	6086	6086	6086	5410	5410	5410	4869	4869	4869	4869	4869	4328	4098	3688	3688	3688	3688	3688	
	FEED	1609	1302	1302	1302	1302	1028	1028	1407	1139	1139	1139	1139	1139	900	1074	870	870	870	870	870	
Ap	0.094	0.083	0.083	0.083	0.073	0.073	0.068	0.117	0.104	0.104	0.104	0.104	0.104	0.091	0.140	0.125	0.109	0.109	0.109	0.109		
40	Vc	278	250	250	250	250	222	222	288	260	260	260	260	260	231	257	232	232	232	232	232	
	fz	0.164	0.148	0.148	0.148	0.148	0.131	0.131	0.174	0.157	0.157	0.157	0.157	0.157	0.139	0.187	0.168	0.168	0.168	0.168	0.168	
	RPM	11065	9959	9959	9959	9959	8852	8852	9180	8262	8262	8262	8262	8262	7344	6830	6147	6147	6147	6147	6147	
	FEED	3629	2948	2948	2948	2948	2319	2319	3195	2594	2594	2594	2594	2594	2042	2554	2065	2065	2065	2065	2065	
Ap	0.122	0.109	0.109	0.109	0.095	0.095	0.088	0.153	0.136	0.136	0.136	0.136	0.136	0.119	0.119	0.184	0.163	0.143	0.143	0.143		
41	Vc	232	209	209	209	209	185	185	242	218	218	218	218	218	194	216	195	195	195	195	195	
	fz	0.150	0.135	0.135	0.135	0.135	0.120	0.120	0.160	0.144	0.144	0.144	0.144	0.144	0.128	0.170	0.153	0.153	0.153	0.153	0.153	
	RPM	9221	8299	8299	8299	8299	7377	7377	7704	6934	6934	6934	6934	6934	6163	5737	5163	5163	5163	5163	5163	
	FEED	2766	2241	2241	2241	2241	1770	1770	2465	1997	1997	1997	1997	1997	1578	1951	1580	1580	1580	1580	1580	
Ap	0.122	0.109	0.109	0.109	0.095	0.095	0.088	0.153	0.136	0.136	0.136	0.136	0.136	0.119	0.119	0.184	0.163	0.143	0.143	0.143		



Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

### HPI89 SERIES 2 FLUTE CORNER RADIUS for RIB PROCESSING

ISO	VDI 3323	Material Description	Slotting Ae	Parameter LBS	Diameter (Ø)																		
					0.2 0.5	0.2 1	0.2 1.5	0.2 2	0.3 1	0.3 1.5	0.3 2	0.3 2.5	0.3 3	0.4 1	0.4 1.5	0.4 2	0.4 2.5	0.4 3	0.5 1	0.5 2	0.5 3		
P	5	Non-alloy steel	1.0D	Vc	31	31	28	28	46	46	42	42	42	42	67	67	67	60	60	60	82	82	74
				fz	0.001	0.001																	



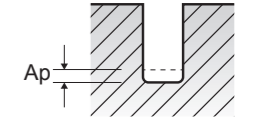
Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

**HPI89 SERIES** 2 FLUTE CORNER RADIUS for RIB PROCESSING

ISO	VDI 3323	Parameter LBS	Diameter (Ø)																					
			0.5 4	0.5 5	0.5 6	0.6 2	0.6 4	0.6 6	0.6 8	0.6 10	0.7 2	0.7 4	0.8 2	0.8 4	0.8 6	0.8 8	0.8 12	0.9 4	0.9 8	1 4	1 6	1 8	1 10	
P	5	Vc	74	74	66	98	88	88	78	59	113	102	102	129	129	116	116	103	144	130	154	139	139	139
		fz	0.004	0.004	0.003	0.005	0.005	0.005	0.004	0.004	0.006	0.005	0.005	0.006	0.006	0.005	0.005	0.005	0.007	0.006	0.010	0.009	0.009	0.009
		RPM	47212	47212	41966	51911	46720	46720	41529	31147	51569	46412	46412	51228	51228	46105	46105	40982	51000	45900	49178	44260	44260	44260
		FEED	378	378	252	519	467	467	332	249	619	464	464	615	615	461	461	410	714	551	984	797	797	797
	8~9	Vc	74	74	66	98	88	88	78	59	113	102	102	129	129	116	116	103	144	130	154	139	139	139
		fz	0.004	0.004	0.003	0.005	0.005	0.005	0.004	0.004	0.006	0.005	0.005	0.006	0.006	0.005	0.005	0.005	0.007	0.006	0.010	0.009	0.009	0.009
		RPM	47212	47212	41966	51911	46720	46720	41529	31147	51569	46412	46412	51228	51228	46105	46105	40982	51000	45900	49178	44260	44260	44260
		FEED	378	378	252	519	467	467	332	249	619	464	464	615	615	461	461	410	714	551	984	797	797	797
	11.1	Vc	74	74	66	98	88	88	78	59	113	102	102	129	129	116	116	103	144	130	154	139	139	139
		fz	0.004	0.004	0.003	0.005	0.005	0.005	0.004	0.004	0.006	0.005	0.005	0.006	0.006	0.005	0.005	0.005	0.007	0.006	0.010	0.009	0.009	0.009
		RPM	47212	47212	41966	51911	46720	46720	41529	31147	51569	46412	46412	51228	51228	46105	46105	40982	51000	45900	49178	44260	44260	44260
		FEED	378	378	252	519	467	467	332	249	619	464	464	615	615	461	461	410	714	551	984	797	797	797
11.2	Vc	65	65	58	88	79	79	70	53	93	84	84	103	103	93	93	82	113	102	124	111	111	111	
	fz	0.003	0.003	0.002	0.004	0.004	0.004	0.003	0.003	0.005	0.005	0.005	0.006	0.006	0.005	0.005	0.005	0.007	0.006	0.008	0.007	0.007	0.007	
	RPM	41310	41310	36720	46447	41802	41802	37158	27868	42230	38007	38007	40983	40983	36885	36885	32786	40072	36065	39343	35409	35409	35409	
	FEED	248	248	147	372	334	334	223	167	422	380	380	492	492	369	369	328	561	433	629	496	496	496	
H	38.1	Vc	65	65	58	88	79	79	70	53	93	84	84	103	103	93	93	82	113	102	124	111	111	111
		fz	0.003	0.003	0.002	0.004	0.004	0.004	0.003	0.003	0.005	0.005	0.005	0.006	0.006	0.005	0.005	0.005	0.007	0.006	0.008	0.007	0.007	0.007
		RPM	41310	41310	36720	46447	41802	41802	37158	27868	42230	38007	38007	40983	40983	36885	36885	32786	40072	36065	39343	35409	35409	35409
		FEED	248	248	147	372	334	334	223	167	422	380	380	492	492	369	369	328	561	433	629	496	496	496
	38.2	Vc	60	60	54	77	70	70	62	46	77	69	69	77	77	70	70	62	82	74	82	74	74	74
		fz	0.003	0.003	0.002	0.004	0.004	0.004	0.003	0.003	0.005	0.005	0.005	0.006	0.006	0.005	0.005	0.005	0.007	0.006	0.008	0.007	0.007	0.007
		RPM	38359	38359	34097	40983	36885	36885	32786	24590	35020	31518	31518	30737	30737	27663	27663	24590	29143	26229	26229	23606	23606	23606
		FEED	230	230	136	328	295	295	197	148	350	252	252	307	307	277	277	197	350	262	367	283	283	283
	39.1	Vc	46	46	41	57	51	51	45	34	62	56	56	67	67	60	60	54	67	60	67	60	60	60
		fz	0.002	0.002	0.002	0.003	0.003	0.003	0.002	0.002	0.004	0.004	0.004	0.005	0.005	0.004	0.004	0.003	0.005	0.005	0.006	0.005	0.005	0.005
		RPM	29507	29507	26229	30053	27048	27048	24042	18032	28335	25502	25502	26639	26639	23975	23975	21311	23679	21311	21311	19180	19180	19180
		FEED	118	118	105	180	162	162	96	72	227	153	153	213	213	192	192	128	237	213	213	192	192	192
39.2	Vc	37	37	33	46	42	42	37	28	46	42	42	51	51	46	46	41	52	46	51	46	46	46	
	fz	0.002	0.002	0.001	0.002	0.002	0.002	0.001	0.001	0.003	0.003	0.003	0.004	0.004	0.003	0.003	0.002	0.004	0.004	0.004	0.004	0.004	0.004	
	RPM	23606	23606	20983	24589	22130	22130	19671	14753	21115	19004	19004	20491	20491	18442	18442	16393	18215	16394	16392	14753	14753	14753	
	FEED	94	94	42	98	89	89	79	30	127	76	76	111	111	111	111	66	146	131	131	118	118	118	
39.3	Vc	28	28	25	41	37	37	33	25	42	38	38	41	41	37	37	33	41	37	41	37	37	37	
	fz	0.001	0.001	0.001	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003	
	RPM	17705	17705	15738	21858	19672	19672	17486	13115	18952	17057	17057	16392	16392	14753	14753	13114	14571	13114	13114	11803	11803	11803	
	FEED	35	35	31	87	79	79	70	26	76	68	68	98	98	59	59	52	87	79	79	71	71	71	
40	Vc	65	65	58	88	79	79	70	53	93	84	84	103	103	93	93	82	113	102	124	111	111	111	
	fz	0.003	0.003	0.002	0.004	0.004	0.004	0.003	0.003	0.005	0.005	0.005	0.006	0.006	0.005	0.005	0.005	0.007	0.006	0.008	0.007	0.007	0.007	
	RPM	41310	41310	36720	46447	41802	41802	37158	27868	42230	38007	38007	40983	40983	36885	36885	32786	40072	36065	39343	35409	35409	35409	
	FEED	248	248	147	372	334	334	223	167	422	380	380	492	492	369	369	328	561	433	629	496	496	496	
41	Vc	60	60	54	77	70	70	62	46	77	69	69	77	77	70	70	62	82	74	82	74	74	74	
	fz	0.003	0.003	0.002	0.004	0.004	0.004	0.003	0.003	0.005	0.005	0.005	0.006	0.006	0.005	0.005	0.005	0.007	0.006	0.008	0.007	0.007	0.007	
	RPM	38359	38359	34097	40983	36885	36885	32786	24590	35020	31518	31518	30737	30737	27663	27663	24590	29143	26229	26229	23606	23606	23606	
	FEED	230	230	136	328	295	295	197	148	350	252	252	307	307	277	277	197	350	262	367	283	283	283	

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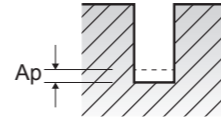
**HPI89 SERIES** 2 FLUTE CORNER RADIUS for RIB PROCESSING



Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

VDI 3323	Parameter LBS	Diameter (Ø)																				
		1 12	1 16	1 20	1.5 4	1.5 8	1.5 12	1.5 15	1.5 20	2 6	2 8	2 12	2 16	2 20	2 25	2 30	3 8	3 12	3 16	3 20	3 30	3 35
5	Vc	124	93	93	196	176	176	176	157	216	216	195	195	195	173	173	211	211	190	190	190	169
	fz	0.008	0.007	0.007	0.011	0.010	0.010	0.010	0.009	0.013	0.013	0.012	0.012	0.012	0.010	0.010	0.019	0.019	0.017	0.017	0.017	0.015
	RPM	39342	29507	29507	41581	37423	37423	37423	33265	34426	34426	30983	30983	30983	27541	27541	22404	22404	20164	20164	20164	17923
	FEED	629	413	413	915	748	748	748	599	895	895	744	744	744	551	551	851	851	686	686	686	538
8~9	Vc	124	93	93	196	176	176	176	157	216	216	195	195	195	173	173	211	211	190	190	190	169
	fz	0.008	0.007	0.007	0.011	0.010	0.010	0.010	0.009	0.013	0.013	0.012	0.012	0.012	0.010	0.010	0.019	0.019	0.017	0.017	0.017	0.015
	RPM	39342	29507	29507	41581	37423	37423	37423	33265	34426	34426	30983	30983	30983	27541	27541	22404	22404	20164	20164	20164	17923
	FEED	629	413	413	915	748	748	748	599	895	895	744	744	744	551	551	851	851	686	686	686	538
11.1	Vc	124	93	93	196	176	176	176	157	216	216	195	195	195	173	173	211	211	190	190	190	169
	fz	0.008																				

**HPI88 SERIES** 2 FLUTE SQUARE for RIB PROCESSING

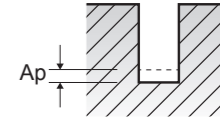


Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Material Description	Slotting Ae	Parameter LBS	Diameter (Ø)																			
					0.2					0.3					0.4					0.6				
					0.5	0.75	1	1.5	2	2.5	3	1	1.5	2	2.5	3	1	1.5	2	2.5	3	3.5		
P	5	Non-alloy steel	1.0D	Vc	31	31	31	28	28	25	25	46	46	42	42	42	67	67	67	60	60	60		
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002		
				RPM	49178	49178	49178	44260	44260	39342	39342	49178	49178	44260	44260	44260	53277	53277	53277	47949	47949	47949		
				FEED	98	98	98	89	89	79	79	197	197	177	177	177	213	213	213	192	192	192		
	8~9	Low alloy steel	1.0D	Vc	31	31	31	28	28	25	25	46	46	42	42	42	67	67	67	60	60	60		
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002		
				RPM	49178	49178	49178	44260	44260	39342	39342	49178	49178	44260	44260	44260	53277	53277	53277	47949	47949	47949		
				FEED	98	98	98	89	89	79	79	197	197	177	177	177	213	213	213	192	192	192		
	11.1	High alloyed steel, and tool steel	1.0D	Vc	31	31	31	28	28	25	25	41	41	37	37	37	57	57	57	51	51	51		
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002		
				RPM	49178	49178	49178	44260	44260	39342	39342	49178	49178	44260	44260	44260	53277	53277	53277	47949	47949	47949		
				FEED	98	98	98	89	89	79	79	197	197	177	177	177	213	213	213	192	192	192		
11.2	High alloyed steel, and tool steel	1.0D	Vc	31	31	31	28	28	25	25	41	41	37	37	37	57	57	57	51	51	51			
			fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002			
			RPM	49178	49178	49178	44260	44260	39342	39342	43714	43714	39343	39343	39343	45081	45081	45081	40573	40573	40573			
			FEED	98	98	98	89	89	79	79	175	175	157	157	157	180	180	180	162	162	162			
H	38.1	Hardened steel	1.0D	Vc	31	31	31	28	28	25	25	41	41	37	37	37	57	57	57	51	51	51		
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002		
				RPM	49178	49178	49178	44260	44260	39342	39342	43714	43714	39343	39343	39343	45081	45081	45081	40573	40573	40573		
				FEED	98	98	98	89	89	79	79	175	175	157	157	157	180	180	180	162	162	162		
	38.2	Hardened steel	1.0D	Vc	26	26	26	23	23	21	21	41	41	37	37	37	52	52	52	46	46	46		
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002		
				RPM	40983	40983	40983	36885	36885	32786	32786	43714	43714	39343	39343	39343	40983	40983	40983	36885	36885	36885		
				FEED	82	82	82	74	74	66	66	87	87	79	79	79	164	164	164	148	148	148		
	39.1	Hardened steel	1.0D	Vc	21	21	21	19	19	16	16	31	31	28	28	28	41	41	41	37	37	37		
				fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001		
				RPM	32786	32786	32786	29507	29507	26229	26229	32786	32786	29507	29507	29507	32786	32786	32786	29507	29507	29507		
				FEED	66	66	66	59	59	52	52	66	66	59	59	59	66	66	66	59	59	59		
39.2	Hardened steel	1.0D	Vc	21	21	21	19	19	16	16	26	26	23	23	23	31	31	31	28	28	28			
			fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001			
			RPM	32786	32786	32786	29507	29507	26229	26229	27322	27322	24590	24590	24590	24589	24589	24589	22130	22130	22130			
			FEED	66	66	66	59	59	52	52	55	55	49	49	49	49	49	49	44	44	44			
39.3	Hardened steel	1.0D	Vc	21	21	21	19	19	16	16	21	21	19	19	19	26	26	26	23	23	23			
			fz	0.009	0.009	0.009	0.008	0.008	0.007	0.007	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001			
			RPM	32786	32786	32786	29507	29507	26229	26229	21858	21858	19672	19672	19672	20491	20491	20491	18442	18442	18442			
			FEED	590	590	590	472	472	367	367	44	44	39	39	39	41	41	41	37	37	37			
40	Chilled Cast Iron	1.0D	Vc	31	31	31	28	28	25	25	41	41	37	37	37	57	57	57	51	51	51			
			fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002			
			RPM	49178	49178	49178	44260	44260	39342	39342	43714	43714	39343	39343	39343	45081	45081	45081	40573	40573	40573			
			FEED	98	98	98	89	89	79	79	175	175	157	157	157	180	180	180	162	162	162			
41	Hardened Cast Iron	1.0D	Vc	26	26	26	23	23	21	21	41	41	37	37	37	52	52	52	46	46	46			
			fz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002			
			RPM	40983	40983	40983	36885	36885	32786	32786	43714	43714	39343	39343	39343	40983	40983	40983	36885	36885	36885			
			FEED	82	82	82	74	74	66	66	87	87	79	79	79	164	164	164	148	148	148			

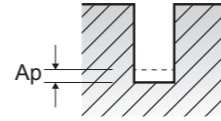
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**HPI88 SERIES** 2 FLUTE SQUARE for RIB PROCESSING



Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

VDI 3323	Parameter LBS	Diameter (Ø)																			
		0.4					0.5					0.6					0.8				
		4	5	6	8	10	1	1.5	2	2.5	3	3.5	4	4.5	5	6	7	8	9	10	1.5
5	Vc	60	54	54	40	20	82	82	82	82	74	74	74	74	66	66	49	49	49	98	98
	fz	0.002	0.002	0.002	0.001	0.001	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.005	0.005
	RPM	47949	42622	42622	31966	15983	52458	52458	52458	52458	47212	47212	47212	47212	41966	41966	31475	31475	31475	51911	51911
	FEED	192	170	170	64	32	420	420	420	420	378	378	378	378	252	252	189	189	189	519	519
8~9	Vc	60	54	54	40	20	82	82	82	82	74	74	74	74	66	66	49	49	49	98	98
	fz	0.002	0.002	0.002	0.001	0.001	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.005	0.005
	RPM	47949	42622	42622	31966	15983	52458	52458	52458	52458	47212	47212	47212	47212	41966	41966	31475	31475	31475	51911	51911
	FEED	192	170	170	64	32	420	420	420	420	378	378	378	378	252	252	189	189	189	519	519
11.1	Vc	60	54	54	40	20	82	82	82	82	74	74	74	74	66	66	49	49	49	98	98
	fz	0.002	0.002	0.002	0.001	0.001	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.005	0.005
	RPM	47949	42622	42622	31966	15983	52458	52458	52458	52458	47212	47212	47212	47212	41966	41966	31475	31475	31475	51911	51911
	FEED	192	170	170	64	32	420	420	420	420	378	378	378	378	252	252	189	189	189	519	519
11.2	Vc	51	45	45	34	17	72	72	72	72	65	65	65	65	58	58	43	43	43	88	88
	fz	0.002	0.002	0.002	0.001	0.001	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.004	0.004
	RPM	40573	36065	36065	27049	13524	45900	45900	45900	45900	41310	41310	41310	41310	36720	36720	27540	27540	27540	46447	46447
	FEED	162	144	144	54	27	275	275	275	275	248	248	248	248	147	147	110	110	110	372	372
38.1	Vc	51	45	45	34	17	72	72	72	72	65	65	65	65	58	58	43	43	43	88	88
	fz	0.002																			



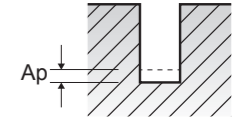
Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

**HPI88 SERIES** 2 FLUTE SQUARE for RIB PROCESSING

ISO	VDI 3323	Parameter LBS	Diameter (Ø)																			
			0.6					0.7					0.8					1				
			3	4	5	6	2	4	6	8	10	3	4	5	6	8	10	12	2	3	4	5
P	5	Vc	98	88	88	88	113	102	102	91	91	129	129	116	116	116	103	103	154	154	154	154
		fz	0.005	0.005	0.005	0.005	0.006	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.010	0.010	0.010	0.010
		RPM	51911	46720	46720	46720	51569	46412	46412	41255	41255	51228	51228	46105	46105	46105	40982	40982	49178	49178	49178	49178
		FEED	519	467	467	467	619	464	464	330	330	615	615	461	461	461	410	410	984	984	984	984
	Ap	0.027	0.024	0.021	0.021	0.035	0.028	0.025	0.025	0.021	0.036	0.036	0.032	0.032	0.028	0.028	0.024	0.050	0.050	0.045	0.045	
	8~9	Vc	98	88	88	88	113	102	102	91	91	129	129	116	116	116	103	103	154	154	154	154
		fz	0.005	0.005	0.005	0.005	0.006	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.010	0.010	0.010	0.010
		RPM	51911	46720	46720	46720	51569	46412	46412	41255	41255	51228	51228	46105	46105	46105	40982	40982	49178	49178	49178	49178
		FEED	519	467	467	467	619	464	464	330	330	615	615	461	461	461	410	410	984	984	984	984
	Ap	0.027	0.024	0.021	0.021	0.035	0.028	0.025	0.025	0.021	0.036	0.036	0.032	0.032	0.028	0.028	0.024	0.050	0.050	0.045	0.045	
	11.1	Vc	98	88	88	88	113	102	102	91	91	129	129	116	116	116	103	103	154	154	154	154
		fz	0.005	0.005	0.005	0.005	0.006	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.010	0.010	0.010	0.010
RPM		51911	46720	46720	46720	51569	46412	46412	41255	41255	51228	51228	46105	46105	46105	40982	40982	49178	49178	49178	49178	
FEED		519	467	467	467	619	464	464	330	330	615	615	461	461	461	410	410	984	984	984	984	
Ap	0.027	0.024	0.021	0.021	0.035	0.028	0.025	0.025	0.021	0.036	0.036	0.032	0.032	0.028	0.028	0.024	0.050	0.050	0.045	0.045		
11.2	Vc	88	79	79	79	93	84	84	74	74	103	103	93	93	93	82	82	124	124	124	124	
	fz	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.008	0.008	0.008	0.008	
	RPM	46447	41802	41802	41802	42230	38007	38007	33784	33784	40983	40983	36885	36885	36885	32786	32786	39343	39343	39343	39343	
	FEED	372	334	334	334	422	380	380	270	270	492	492	369	369	369	328	328	629	629	629	629	
Ap	0.023	0.020	0.018	0.018	0.030	0.024	0.021	0.021	0.018	0.031	0.031	0.027	0.027	0.024	0.024	0.020	0.043	0.043	0.038	0.038		
H	38.1	Vc	88	79	79	79	93	84	84	74	74	103	103	93	93	93	82	82	124	124	124	124
		fz	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.008	0.008	0.008	0.008
		RPM	46447	41802	41802	41802	42230	38007	38007	33784	33784	40983	40983	36885	36885	36885	32786	32786	39343	39343	39343	39343
		FEED	372	334	334	334	422	380	380	270	270	492	492	369	369	369	328	328	629	629	629	629
	Ap	0.023	0.020	0.018	0.018	0.030	0.024	0.021	0.021	0.018	0.031	0.031	0.027	0.027	0.024	0.024	0.020	0.043	0.043	0.038	0.038	
	38.2	Vc	77	70	70	70	77	69	69	62	62	77	77	70	70	70	62	62	82	82	82	82
		fz	0.004	0.004	0.004	0.004	0.005	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.007	0.007	0.007	0.007
		RPM	40983	36885	36885	36885	35020	31518	31518	28016	28016	30737	30737	27663	27663	27663	24590	24590	26229	26229	26229	26229
		FEED	328	295	295	295	350	252	252	224	224	307	307	277	277	277	197	197	367	367	367	367
	Ap	0.023	0.020	0.018	0.018	0.030	0.024	0.021	0.021	0.018	0.031	0.031	0.027	0.027	0.024	0.024	0.020	0.043	0.043	0.038	0.038	
	39.1	Vc	57	51	51	51	62	56	56	50	50	67	67	60	60	60	54	54	67	67	67	67
		fz	0.003	0.003	0.003	0.003	0.004	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.005	0.005	0.005	0.005
RPM		30053	27048	27048	27048	28335	25502	25502	22668	22668	26639	26639	23975	23975	23975	21311	21311	21311	21311	21311	21311	
FEED		180	162	162	162	227	153	153	136	136	213	213	192	192	192	128	128	213	213	213	213	
Ap	0.022	0.019	0.017	0.017	0.028	0.022	0.020	0.020	0.017	0.029	0.029	0.026	0.026	0.022	0.022	0.019	0.040	0.040	0.036	0.036		
39.2	Vc	46	42	42	42	46	42	42	37	37	51	51	46	46	46	41	41	51	51	51	51	
	fz	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.004	0.004	0.004	0.004	
	RPM	24589	22130	22130	22130	21115	19004	19004	16892	16892	20491	20491	18442	18442	18442	16393	16393	16392	16392	16392	16392	
	FEED	98	89	89	89	127	76	76	68	68	123	123	111	111	111	66	66	131	131	131	131	
Ap	0.022	0.019	0.017	0.017	0.028	0.022	0.020	0.020	0.017	0.029	0.029	0.026	0.026	0.022	0.022	0.019	0.040	0.040	0.036	0.036		
39.3	Vc	41	37	37	37	42	38	38	33	33	41	41	37	37	37	33	33	41	41	41	41	
	fz	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	
	RPM	21858	19672	19672	19672	18952	17057	17057	15162	15162	16392	16392	14753	14753	14753	13114	13114	13114	13114	13114	13114	
	FEED	87	79	79	79	76	68	68	61	61	98	98	59	59	59	52	52	79	79	79	79	
Ap	0.018	0.016	0.014	0.014	0.023	0.018	0.016	0.016	0.014	0.023	0.023	0.021	0.021	0.018	0.018	0.016	0.033	0.033	0.029	0.029		
40	Vc	88	79	79	79	93	84	84	74	74	103	103	93	93	93	82	82	124	124	124	124	
	fz	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.004	0.004	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.008	0.008	0.008	0.008	
	RPM	46447	41802	41802	41802	42230	38007	38007	33784	33784	40983	40983	36885	36885	36885	32786	32786	39343	39343	39343	39343	
	FEED	372	334	334	334	422	380	380	270	270	492	492	369	369	369	328	328	629	629	629	629	
Ap	0.023	0.020	0.018	0.018	0.030	0.024	0.021	0.021	0.018	0.031	0.031	0.027	0.027	0.024	0.024	0.020	0.043	0.043	0.038	0.038		
41	Vc	77	70	70	70	77	69	69	62	62	77	77	70	70	70	62	62	82	82	82	82	
	fz	0.004	0.004	0.004	0.004	0.005	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.007	0.007	0.007	0.007	
	RPM	40983	36885	36885	36885	35020	31518	31518	28016	28016	30737	30737	27663	27663	27663	24590	24590	26229	26229	26229	26229	
	FEED	328	295	295	295	350	252	252	224	224	307	307	277	277	277	197	197	367	367	367	367	
Ap	0.023	0.020	0.018	0.018	0.030	0.024	0.021	0.021	0.018	0.031	0.031	0.027	0.027	0.024	0.024	0.020	0.043	0.043	0.038	0.038		

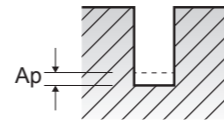
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**HPI88 SERIES** 2 FLUTE SQUARE for RIB PROCESSING



Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Parameter LBS	Diameter (Ø)																
			1			1.2			1.5			1.8			2.0				
			6	7	8	9	10	12	14	16	18	20	22	24	26	28	30		
P	5	Vc	139	139	139	139	139	124	124	93	93	93	46	170	153	153	153	136	185



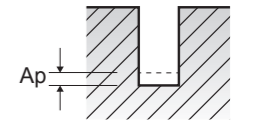
Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

**HPI88 SERIES** 2 FLUTE SQUARE for RIB PROCESSING

ISO	VDI 3323	Parameter	Diameter (Ø)																			
			1.5					1.6					1.8					2				
			10	12	14	16	18	20	25	30	35	6	8	6	8	10	12	14	16	18	2	2
P	5	Vc	176	176	176	157	157	157	118	118	59	201	201	226	226	203	203	203	203	203	216	216
		fz	0.010	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.007	0.012	0.012	0.012	0.012	0.010	0.010	0.010	0.010	0.010	0.013	0.013
		RPM	37423	37423	37423	33265	33265	33265	24949	24949	12474	39958	39958	39958	39958	35962	35962	35962	35962	35962	34426	34426
	8~9	Vc	176	176	176	157	157	157	118	118	59	201	201	226	226	203	203	203	203	203	216	216
		fz	0.010	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.007	0.012	0.012	0.012	0.012	0.010	0.010	0.010	0.010	0.010	0.013	0.013
		RPM	37423	37423	37423	33265	33265	33265	24949	24949	12474	39958	39958	39958	39958	35962	35962	35962	35962	35962	34426	34426
	11.1	Vc	176	176	176	157	157	157	118	118	59	201	201	226	226	203	203	203	203	203	216	216
		fz	0.010	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.007	0.012	0.012	0.012	0.012	0.010	0.010	0.010	0.010	0.010	0.013	0.013
		RPM	37423	37423	37423	33265	33265	33265	24949	24949	12474	39958	39958	39958	39958	35962	35962	35962	35962	35962	34426	34426
	11.2	Vc	139	139	139	123	123	123	93	93	46	161	161	181	181	163	163	163	163	163	170	170
		fz	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.006	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.013	0.013
		RPM	29479	29479	29479	26203	26203	26203	19652	19652	9826	31966	31966	31966	31966	28769	28769	28769	28769	28769	27049	27049
H	38.1	Vc	139	139	139	123	123	123	93	93	46	161	161	181	181	163	163	163	163	163	170	170
		fz	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.006	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.013	0.013
		RPM	29479	29479	29479	26203	26203	26203	19652	19652	9826	31966	31966	31966	31966	28769	28769	28769	28769	28769	27049	27049
	38.2	Vc	93	93	93	83	83	83	62	62	31	106	106	119	119	107	107	107	107	107	113	113
		fz	0.008	0.008	0.008	0.007	0.007	0.007	0.006	0.006	0.005	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.012	0.012
		RPM	19745	19745	19745	17551	17551	17551	13163	13163	6582	21106	21106	21106	21106	18995	18995	18995	18995	18995	18032	18032
	39.1	Vc	74	74	74	66	66	66	50	50	25	85	85	96	96	87	87	87	87	87	93	93
		fz	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.004	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.009	0.009
		RPM	15759	15759	15759	14008	14008	14008	10506	10506	5253	17007	17007	17007	17007	15306	15306	15306	15306	15306	14754	14754
	39.2	Vc	56	56	56	50	50	50	37	37	19	65	65	73	73	66	66	66	66	66	72	72
		fz	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.003	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.007	0.007
		RPM	11866	11866	11866	10547	10547	10547	7910	7910	3955	12910	12910	12910	12910	11619	11619	11619	11619	11619	11475	11475
39.3	Vc	47	47	47	42	42	42	31	31	16	55	55	61	61	55	55	55	55	55	62	62	
	fz	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.006	0.006	
	RPM	9919	9919	9919	8817	8817	8817	6613	6613	3306	10860	10860	10860	10860	9774	9774	9774	9774	9774	9835	9835	
40	Vc	139	139	139	123	123	123	93	93	46	161	161	181	181	163	163	163	163	163	170	170	
	fz	0.009	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.006	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.013	0.013	
	RPM	29479	29479	29479	26203	26203	26203	19652	19652	9826	31966	31966	31966	31966	28769	28769	28769	28769	28769	27049	27049	
41	Vc	93	93	93	83	83	83	62	62	31	106	106	119	119	107	107	107	107	107	113	113	
	fz	0.008	0.008	0.008	0.007	0.007	0.007	0.006	0.006	0.005	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.012	0.012	
	RPM	19745	19745	19745	17551	17551	17551	13163	13163	6582	21106	21106	21106	21106	18995	18995	18995	18995	18995	18032	18032	

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**HPI88 SERIES** 2 FLUTE SQUARE for RIB PROCESSING

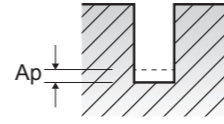


Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Parameter	Diameter (Ø)																					
			2				2.5				3				3									
			8	10	12	14	16	18	20	25	30	35	40	50	8	12	16	20	25	30	40	50		
P	5	Vc	216	216	195	195	195	195	195	173	173	130	130	65	217	217	195	195	173	130	130	211	211	
		fz	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.009	0.008	0.016	0.016	0.014	0.014	0.013	0.011	0.011	0.019	0.019
		RPM	34426	34426	30983	30983	30983	30983	30983	27541	27541	20656	20656	10328	27604	27604	24844	24844	22083	16562	16562	22404	22404	
	8~9	Vc	216	216	195	195	195	195	195	173	173	130	130	65	217	217	195	195	173	130	130	211	211	
		fz	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.009	0.008	0.016	0.016	0.014	0.014	0.013	0.011	0.011	0.019	0.019	
		RPM	34426	34426	30983	30983	30983	30983	30983	27541	27541	20656	20656	10328	27604	27604	24844	24844	22083	16562	16562	22404	22404	
	11.1	Vc	216	216	195	195	195	195	195	173	173	130	130	65	217	217	195	195	173	130	130	211	211	
		fz	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.009	0.008	0.016	0.016	0.014	0.014	0.013	0.011	0.011	0.019	0.019	
		RPM	34426	34426	30983	30983	30983	30983	30983	27541	27541	20656	20656	10328	27604	27604	24844	24844	22083	16562	16562	22404	22404	
	11.2	Vc	170	170	153	153	153	153	136	136	102	102	51	170	170	153	153	136	102	102	170	170		
		fz	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.008	0.017	0.017	0.015	0.015	0.013	0.012	0.012	0.020	0.020		
		RPM	27049	27049	24344	24344	24344	24344	24344	21639	21639	16229	16229	8115	21630	21630	19467	19467	17304	12978	12978	18032	18032	
H	38.1	Vc	170	170	153	153	153	153	136	136	102	102	51	170	170	153	153	136	102	102	170	170		
		fz	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.010	0.010	0.009	0.008	0.017	0.017	0.015	0.015	0.013	0.012	0.012	0.020	0.020		
		RPM	27049	27049	24344	24344	24344	24344	24344	21639	21639	16229	16229	8115	21630	21630	19467	19467	17304	12978	12978	18032	18032	
	38.2	Vc	113	113	102	102	102	102	91	91	68	68	34	113	113	102	102	91	68	68	113	113		
		fz	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.008	0.007	0.015	0.015	0.014	0.014	0.012	0.011	0.011	0.018	0.018		
		RPM	18032	18032	16229	16229	16229	16229	14426	14426	10819	10819	5410	14420	14420	12978	12978	11536	8652	8652	12021	12021		
	39.1	Vc	93	93	83	83	83	83	83	83	74	74	56	28	93	93	84	84	74	56	56	93	93	
		fz	0.009	0.009	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.006	0.006	0.005	0.011	0.011	0.010	0.010	0.009	0.008	0.014	0.014		
		RPM	14754	14754	13279	13279	13279	13279	13279	11803	11803	8852	8852	4426	11845	11845	10661	10661	9476	7107	7			



**HPI88 SERIES** 2 FLUTE SQUARE for RIB PROCESSING



Vc = m/min. fz = mm/tooth Ap = mm  
RPM = rev./min. FEED = mm/min. LBS = Length Below Shank

ISO	VDI 3323	Parameter LBS	Diameter (Ø)																	
			3 16	3 20	3 25	3 30	4 12	4 16	4 20	4 30	4 40	4 50	5 20	5 30	5 40	5 50	6 20	6 30	6 40	6 50
P	5	Vc	190	190	190	190	216	216	216	195	195	173	252	227	227	227	252	252	227	227
		fz	0.017	0.017	0.017	0.017	0.026	0.026	0.026	0.023	0.023	0.021	0.032	0.029	0.029	0.029	0.036	0.036	0.032	0.032
		RPM	20164	20164	20164	20164	17212	17212	17212	15491	15491	13770	16065	14459	14459	14459	13388	13388	12049	12049
		FEED	686	686	686	686	895	895	895	713	713	578	1028	839	839	839	964	964	771	771
	Ap	0.120	0.120	0.105	0.105	0.200	0.180	0.180	0.160	0.140	0.140	0.225	0.200	0.200	0.175	0.270	0.270	0.240	0.210	
	8~9	Vc	190	190	190	190	216	216	216	195	195	173	252	227	227	227	252	252	227	227
		fz	0.017	0.017	0.017	0.017	0.026	0.026	0.026	0.023	0.023	0.021	0.032	0.029	0.029	0.029	0.036	0.036	0.032	0.032
		RPM	20164	20164	20164	20164	17212	17212	17212	15491	15491	13770	16065	14459	14459	14459	13388	13388	12049	12049
		FEED	686	686	686	686	895	895	895	713	713	578	1028	839	839	839	964	964	771	771
	11.1	Vc	190	190	190	190	216	216	216	195	195	173	252	227	227	227	252	252	227	227
		fz	0.017	0.017	0.017	0.017	0.026	0.026	0.026	0.023	0.023	0.021	0.032	0.029	0.029	0.029	0.036	0.036	0.032	0.032
		RPM	20164	20164	20164	20164	17212	17212	17212	15491	15491	13770	16065	14459	14459	14459	13388	13388	12049	12049
		FEED	686	686	686	686	895	895	895	713	713	578	1028	839	839	839	964	964	771	771
	11.2	Vc	153	153	153	153	170	170	170	153	153	136	201	181	181	181	201	201	181	181
		fz	0.018	0.018	0.018	0.018	0.027	0.027	0.027	0.024	0.024	0.022	0.032	0.029	0.029	0.029	0.037	0.037	0.033	0.033
		RPM	16229	16229	16229	16229	13524	13524	13524	12172	12172	10819	12786	11507	11507	11507	10655	10655	9590	9590
FEED		584	584	584	584	730	730	730	584	584	476	818	667	667	667	788	788	633	633	
H	38.1	Vc	153	153	153	153	170	170	170	153	153	136	201	181	181	181	201	201	181	181
		fz	0.018	0.018	0.018	0.018	0.027	0.027	0.027	0.024	0.024	0.022	0.032	0.029	0.029	0.029	0.037	0.037	0.033	0.033
		RPM	16229	16229	16229	16229	13524	13524	13524	12172	12172	10819	12786	11507	11507	11507	10655	10655	9590	9590
		FEED	584	584	584	584	730	730	730	584	584	476	818	667	667	667	788	788	633	633
	38.2	Vc	102	102	102	102	113	113	113	102	102	91	134	121	121	121	134	134	121	121
		fz	0.016	0.016	0.016	0.016	0.025	0.025	0.025	0.023	0.023	0.020	0.030	0.027	0.027	0.027	0.035	0.035	0.032	0.032
		RPM	10819	10819	10819	10819	9017	9017	9017	8115	8115	7214	8524	7672	7672	7672	7104	7104	6394	6394
		FEED	346	346	346	346	451	451	451	373	373	289	511	414	414	414	497	497	409	409
	39.1	Vc	83	83	83	83	93	93	93	83	83	74	103	93	93	93	103	103	93	93
		fz	0.013	0.013	0.013	0.013	0.019	0.019	0.019	0.017	0.017	0.015	0.022	0.020	0.020	0.020	0.026	0.026	0.023	0.023
		RPM	8852	8852	8852	8852	7377	7377	7377	6639	6639	5902	6557	5901	5901	5901	5464	5464	4918	4918
		FEED	230	230	230	230	280	280	280	226	226	177	289	236	236	236	284	284	226	226
	39.2	Vc	65	65	65	65	72	72	72	65	65	58	82	74	74	74	82	82	74	74
		fz	0.010	0.010	0.010	0.010	0.015	0.015	0.015	0.014	0.014	0.012	0.018	0.016	0.016	0.016	0.021	0.021	0.019	0.019
		RPM	6885	6885	6885	6885	5737	5737	5737	5163	5163	4590	5246	4721	4721	4721	4371	4371	3934	3934
		FEED	138	138	138	138	172	172	172	145	145	110	189	151	151	151	184	184	149	149
39.3	Vc	56	56	56	56	62	62	62	56	56	49	72	65	65	65	72	72	65	65	
	fz	0.008	0.008	0.008	0.008	0.012	0.012	0.012	0.011	0.011	0.010	0.015	0.013	0.013	0.013	0.018	0.018	0.016	0.016	
	RPM	5901	5901	5901	5901	4918	4918	4918	4426	4426	3934	4590	4131	4131	4131	3825	3825	3443	3443	
	FEED	94	94	94	94	118	118	118	97	97	79	138	107	107	107	138	138	110	110	
40	Vc	153	153	153	153	170	170	170	153	153	136	201	181	181	181	201	201	181	181	
	fz	0.018	0.018	0.018	0.018	0.027	0.027	0.027	0.024	0.024	0.022	0.032	0.029	0.029	0.029	0.037	0.037	0.033	0.033	
	RPM	16229	16229	16229	16229	13524	13524	13524	12172	12172	10819	12786	11507	11507	11507	10655	10655	9590	9590	
	FEED	584	584	584	584	730	730	730	584	584	476	818	667	667	667	788	788	633	633	
41	Vc	102	102	102	102	113	113	113	102	102	91	134	121	121	121	134	134	121	121	
	fz	0.016	0.016	0.016	0.016	0.025	0.025	0.025	0.023	0.023	0.020	0.030	0.027	0.027	0.027	0.035	0.035	0.032	0.032	
	RPM	10819	10819	10819	10819	9017	9017	9017	8115	8115	7214	8524	7672	7672	7672	7104	7104	6394	6394	
	FEED	346	346	346	346	451	451	451	373	373	289	511	414	414	414	497	497	409	409	

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