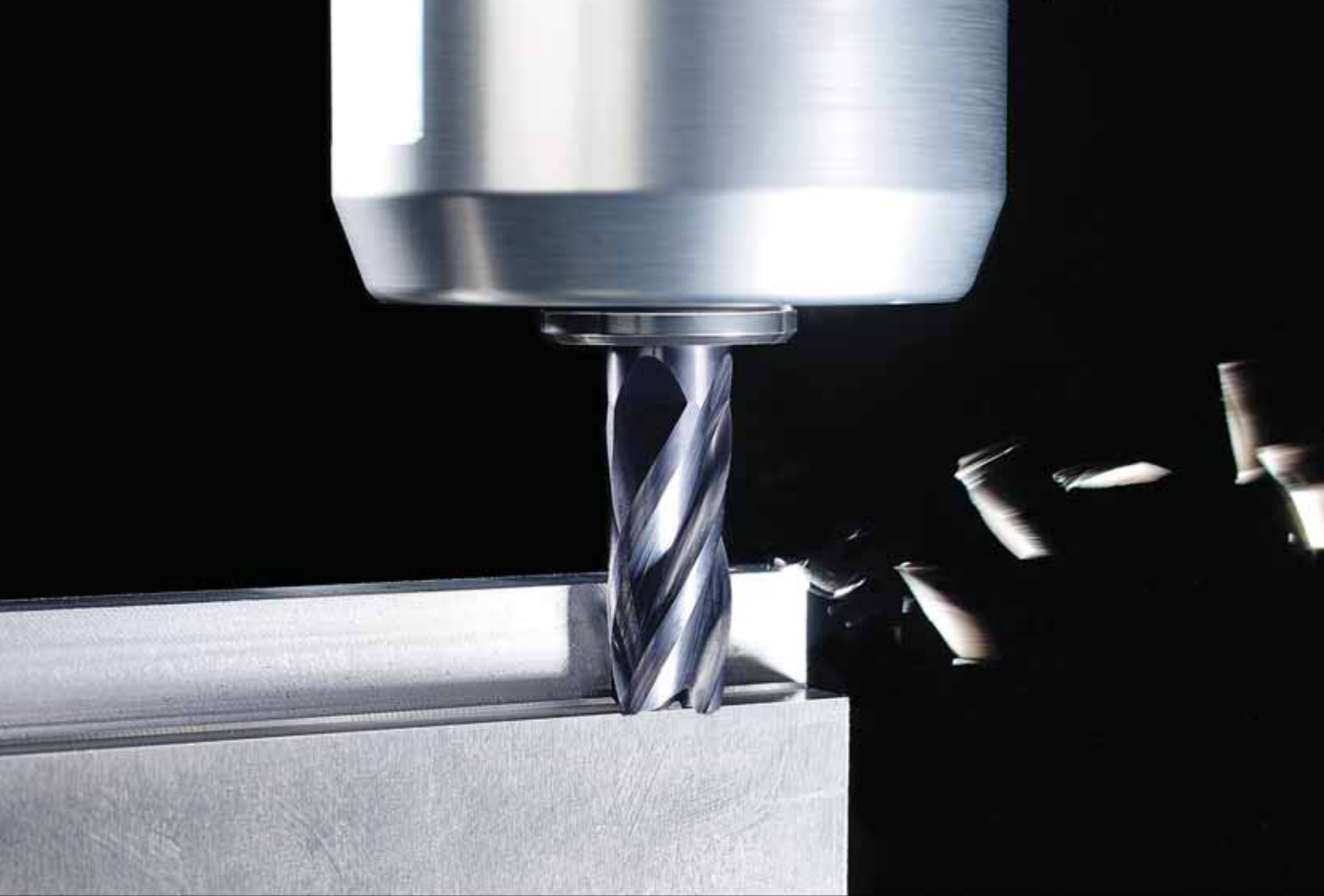




2017 | GENERAL PURPOSE END MILLS

WIDIA™ HANITA™ 



PRIMED FOR PRODUCTIVITY

Our philosophy is simple — be the best. We come from humble beginnings, but our industriousness and fortitude keep us ahead of the market. Innovation. Creativity. Productivity. These are the very foundation on which all that we are has been built. Our endeavors have led to unparalleled metal removal rates and titanium machining optimized through geometry.

But maybe our greatest strength is helping our customers reach their full potential. We are more than innovators. We are educators. We not only create bold, new technologies; we help others see the possibilities afforded through them. That's why those who want the best solutions for their machining needs come to us. To those who think they don't deserve the best, all we can say is, "You do."

WIDIA™ HANITA™ 

WIDIA-Hanita™ General Purpose End Mill

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ALL-STAR

The new WIDIA™ All-Star program guarantees immediate availability of the most popular products from our proven platforms by combining a complete assortment of high-performance tools with:

VERSATILITY: All-Star tooling solutions are specially selected to cover an extensive range of applications and materials – empowering you to do more and stock less.

VALUE: Proven to win time and time again for manufacturers everywhere, tools in the All-Star platform perform significantly better than general-purpose tooling.

AVAILABILITY: Easy to find, select, and buy — All-Star tooling is guaranteed to be in stock and ship fast!

The WIDIA All-Star program empowers you to meet changing customer demands without sacrificing productivity and profitability.

Get what you need, when you need it, to get the job done.



Accessing the WIDIA All-Star Portfolio

Use your smartphone or tablet to access the most up-to-date All-Star line items in the portfolio via QR codes.

By scanning the QR code on each page, your device will direct you to the web page most relevant to your scan. This page will show you which products are featured in the All-Star portfolio. By engaging with the All-Star program QR codes, you will have immediate access to a range of high-performance metalcutting tools that cover our most relevant and versatile tooling platforms.

QR Code is a registered trademark of Denso Wave Incorporated.



2-Flute General Purpose End Mills

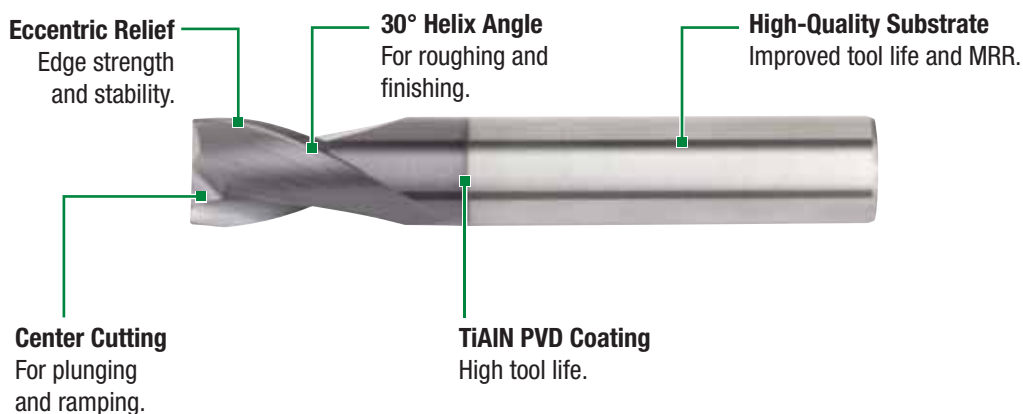
General Purpose End Mills



WIDIA-Hanita™ General Purpose End Mills offer plunging, slotting, and profiling for a wide range of materials and applications. Designed to provide high metal removal rates and excellent surface conditions at a value price. A wide range of diameters, lengths, and corner styles (such as sharp edge and ball nose) are available from stock.

2-Flute General Purpose End Mills

- General purpose tools for a wide range of workpiece materials.
- Roughing and finishing with one tool.
- Various lengths-of-cut and overall lengths with different front end designs available.
- Two flutes for high flexibility in unstable conditions.



2-Flute General Purpose End Mills

- Increased manufacturing flexibility and reduced tool cost.
- Fewer tool changes and high Metal Removal Rates (MRR).
- No specific tool for roughing and finishing required.
- Eccentric relief for improved edge stability and high tool life.
- Easy and cost-efficient regrinding due to eccentric relief.

Series I2S

- Wide range of lengths-of-cut — short, regular, long, and extra long.
- Steel, stainless steel, and cast iron.
- Center cut.



Series I2B

- Wide range of lengths-of-cut — short, regular, long, and extra long.
- Steel, stainless steel, and cast iron.
- Center cut ball nose.

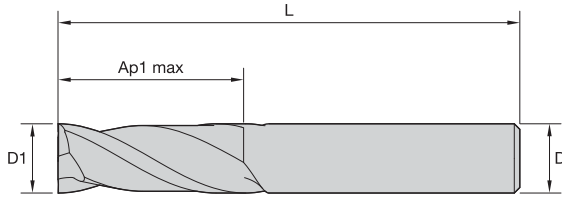


Series I2R

- Regular length-of-cut with corner radius.
- Steel, stainless steel, and cast iron.
- Center cut.



- Center cutting.
- Sharp corners.
- Standard items listed. Additional styles and coatings made-to-order.

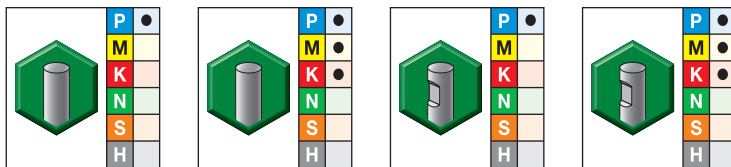


End Mill Tolerances

D1	tolerance e8	D	tolerance h6 + / -
All	+0.000/-0.002	≤ 1/8"	0/0.00024
		> 1/8-1/4"	0/0.00031
		> 1/4-3/8"	0/0.00035
		> 3/8-23/32"	0/0.00043
		> 23/32-1 3/16"	0/0.00051

■ Series I2S • 2-Flute Square-End End Mills

To access the most up-to-date All-Star products in this portfolio, scan here.

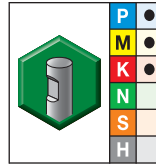
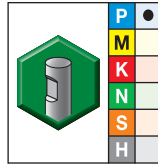
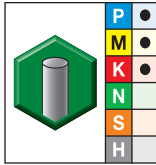
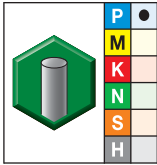
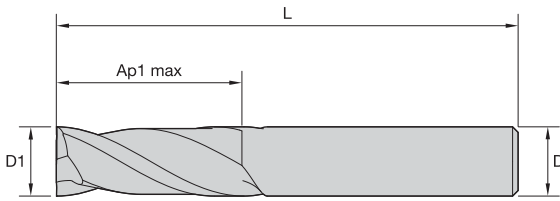


- first choice
- alternate choice

grade UNCOATED	grade TiAlN TiAlN	grade UNCOATED	grade TiAlN TiAlN	D1	D	length of cut Ap1 max	length L
5873648	5872793	—	—	1/64	1/8	1/32	1 1/2
5873649	5872794	—	—	1/32	1/8	5/64	1 1/2
5873661	5872796	—	—	1/16	1/8	1/8	1 1/2
5873650	5872795	—	—	1/16	1/8	3/16	1 1/2
5873662	5872797	—	—	1/16	1/8	1/2	2
5873663	5872798	—	—	5/64	1/8	3/16	1 1/2
5873664	5872799	—	—	3/32	1/8	3/16	1 1/2
5873665	5872800	—	—	3/32	1/8	3/8	1 1/2
5873666	5872841	—	—	3/32	1/8	5/8	2
—	5872843	—	—	7/64	1/8	3/8	1 1/2
5873667	5872844	—	—	1/8	1/8	1/4	1 1/2
5873669	5872845	—	—	1/8	1/8	1/2	1 1/2
5873670	5872846	—	—	1/8	1/8	3/4	2 1/4
5873671	5872847	—	—	1/8	1/8	3/4	3
5873672	5872848	—	—	9/64	3/16	9/16	2
5873673	5872849	—	—	5/32	3/16	5/16	2
5873674	5872850	—	—	5/32	3/16	9/16	2
5873675	5872851	—	—	11/64	3/16	5/8	2
—	5872852	—	—	3/16	3/16	5/16	1 1/2
5873676	5872853	—	—	3/16	3/16	5/8	2
5873677	5872854	—	—	3/16	3/16	3/4	2 1/2
5873678	5872855	—	—	3/16	3/16	1 1/8	3
5873679	5872856	—	—	7/32	1/4	7/16	2
5873680	5872857	—	—	7/32	1/4	5/8	2 1/2
5873681	5872858	—	—	1/4	1/4	1/2	2
5873682	5872859	—	—	1/4	1/4	3/4	2 1/2
5873683	5872860	—	—	1/4	1/4	1 1/8	3
5873684	—	—	—	1/4	1/4	1 1/4	3 1/2

(continued)

(Series I2S • 2-Flute Square-End End Mills – continued)

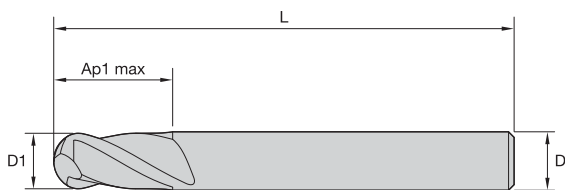


● first choice
○ alternate choice

grade UNCOATED	grade TiAlN TiAlN	grade UNCOATED	grade TiAlN TiAlN	D1	D	length of cut Ap1 max	length L
order #	order #	order #	order #				
5873685	5872861	—	—	1/4	1/4	1 1/2	4
5873686	5872862	—	—	9/32	5/16	3/4	2 1/2
5873755	5872941	—	—	5/16	5/16	1/2	2
5873687	5872863	—	—	5/16	5/16	13/16	2 1/2
5873688	5872864	—	—	5/16	5/16	1 1/8	3
5873689	5872865	—	—	5/16	5/16	1 5/8	4
5873690	5872866	—	—	11/32	3/8	1	2 1/2
5873691	5872867	—	—	3/8	3/8	5/8	2
5873692	5872868	—	—	3/8	3/8	1	2 1/2
5873693	5872869	—	—	3/8	3/8	1 1/8	3
5873694	5872870	—	—	3/8	3/8	1 3/4	4
5873695	5872881	—	—	3/8	3/8	3	6
5873696	5872882	—	—	13/32	7/16	1	2 3/4
5873697	5872883	—	—	7/16	7/16	5/8	2 1/2
5873698	5872884	—	—	7/16	7/16	1	2 1/2
5873699	5872885	—	—	7/16	7/16	2	4
5873700	5872886	—	—	7/16	7/16	3	6
5873711	5872887	—	—	15/32	1/2	1	3
5873712	5872888	—	—	1/2	1/2	5/8	2 1/2
5873713	5872889	5873736	5872922	1/2	1/2	1	3
5873714	5872890	5873737	5872923	1/2	1/2	2	4
5873715	5872891	5873738	5872924	1/2	1/2	3	6
5873716	5872892	5873739	5872925	9/16	9/16	3/4	3
5873717	5872893	5873740	5872926	9/16	9/16	1 1/4	3 1/2
5873718	5872894	5873741	5872927	9/16	9/16	2 1/4	5
5873719	5872895	—	—	5/8	5/8	3/4	3
5873720	5872896	5873742	5872928	5/8	5/8	1 1/4	3 1/2
5873721	5872897	5873743	5872929	5/8	5/8	2 1/4	5
5873722	5872898	5873744	5872930	5/8	5/8	3	6
5873723	5872899	5873745	5872931	5/8	5/8	4	7
5873724	5872900	5873746	5872932	11/16	3/4	1 3/8	4
5873725	5872901	—	—	3/4	3/4	1	3
5873726	5872902	—	—	3/4	3/4	1 1/2	4
5873727	5872903	5873747	5872933	3/4	3/4	2 1/4	5
5873728	5872904	5873748	5872934	3/4	3/4	3	6
5873729	5872905	5873749	5872935	3/4	3/4	4	7
5873730	5872906	5873750	5872936	7/8	7/8	1 1/2	4
5873731	5872907	5873751	5872937	7/8	7/8	2 1/4	5
5873732	5872908	—	—	1	1	1 1/2	4
5873733	5872909	5873752	5872938	1	1	2 1/4	5
5873734	5872910	5873753	5872939	1	1	3	6
5873735	5872921	5873754	5872940	1	1	4	7

NOTE: For application data, please see pages 12–13.

- Center cutting.
- Standard items listed. Additional styles and coatings made-to-order.

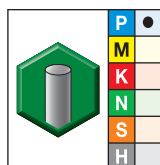


End Mill Tolerances

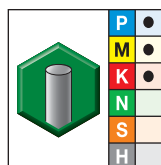
D1	tolerance e8	D	tolerance h6 + / -
All	+0.000/-0.002	≤ 1/8"	0/0.00024
		> 1/8-1/4"	0/0.00031
		> 1/4-3/8"	0/0.00035
		> 3/8-23/32"	0/0.00043
		> 23/32-1 3/16"	0/0.00051

■ Series I2B • 2-Flute Ball Nose End Mills

To access the most up-to-date All-Star products in this portfolio, scan here.



grade UNCOATED



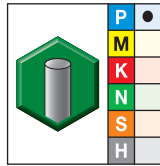
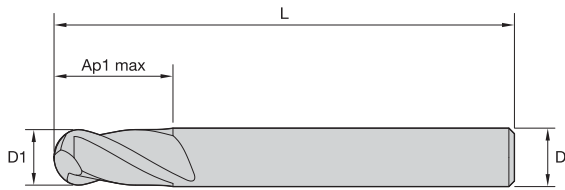
grade TiAlN
TiAlN

- first choice
- alternate choice

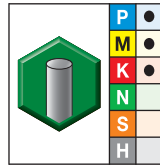
order #	order #	D1	D	length of cut Ap1 max	length L
5878223	5878172	1/32	1/8	5/64	1 1/2
-	5878174	3/64	1/8	3/16	1 1/2
5878224	5878173	1/16	1/8	3/16	1 1/2
-	5878175	5/64	1/8	3/16	1 1/2
-	5878176	3/32	1/8	3/16	1 1/2
5878225	5878177	3/32	1/8	3/8	1 1/2
-	5878178	7/64	1/8	3/8	1 1/2
5878226	5878179	1/8	1/8	1/4	1 1/2
5878227	5878180	1/8	1/8	1/2	1 1/2
-	5878181	1/8	1/8	3/4	2 1/4
-	5878182	1/8	1/8	3/4	3
-	5878183	5/32	3/16	5/16	2
-	5878184	5/32	3/16	9/16	2
-	5878185	3/16	3/16	5/16	1 1/2
5878228	5878186	3/16	3/16	5/8	2
-	5878187	3/16	3/16	3/4	2 1/2
-	5878188	3/16	3/16	1	4
-	5878189	7/32	1/4	5/8	2 1/2
-	5878190	1/4	1/4	1/2	2
5878229	5878191	1/4	1/4	3/4	2 1/2
-	5878192	1/4	1/4	1 1/8	3
-	5878193	1/4	1/4	1 1/2	4
-	5878194	1/4	1/4	1 1/2	6
-	5878195	5/16	5/16	1/2	2
5878230	5878196	5/16	5/16	13/16	2 1/2
-	5878197	5/16	5/16	1 1/8	3
-	5878198	5/16	5/16	1 1/2	6
-	5878199	3/8	3/8	5/8	2

(continued)

(Series I2B • 2-Flute Ball Nose End Mills — continued)



grade UNCOATED



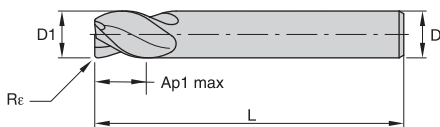
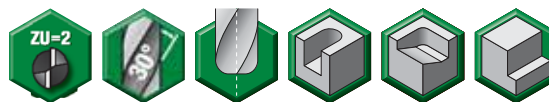
grade TiAlN
TiAlN

- first choice
- alternate choice

order #	order #	D1	D	length of cut Ap1 max	length L
5878241	5878200	3/8	3/8	7/8	2 1/2
-	5878201	3/8	3/8	1 1/8	3
-	5878202	3/8	3/8	1 3/4	4
-	5878203	3/8	3/8	3	6
-	5878204	13/32	7/16	1	2 1/2
-	5878205	7/16	7/16	1	2 1/2
-	5878206	1/2	1/2	5/8	2 1/2
5878242	5878207	1/2	1/2	1	3
-	5878208	1/2	1/2	1 1/2	6
5878243	5878209	1/2	1/2	2	4
-	5878210	1/2	1/2	3	6
-	5878211	5/8	5/8	1 1/4	3 1/2
5878244	5878212	5/8	5/8	2 1/4	5
-	5878213	5/8	5/8	3	6
-	5878214	3/4	3/4	1	3
5878245	5878215	3/4	3/4	1 1/2	4
-	5878216	3/4	3/4	2	6
-	5878217	3/4	3/4	2 1/4	5
-	5878218	3/4	3/4	3	6
5878246	5878219	7/8	7/8	1 1/2	4
-	5878220	1	1	1 1/2	4
5878247	5878221	1	1	3	6

NOTE: For application data, please see pages 14–15.

- Center cutting.
- Radius corner.
- Standard items listed. Additional styles and coatings made-to-order.

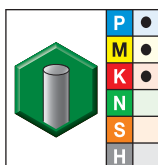


End Mill Tolerances

D1	tolerance e8	D	tolerance h6 + / -
≤ 3	-0,014/-0,028	≤ 3	0/0,006
> 3-6	-0,020/-0,038	> 3-6	0/0,008
> 6-10	-0,025/-0,047	> 6-10	0/0,009
> 10-18	-0,032/-0,059	> 10-18	0/0,011
> 18-30	-0,040/-0,073	> 18-30	0/0,013

■ Series I2R • 2-Flute Radius-Style End Mills

To access the most up-to-date All-Star products in this portfolio, [scan here](#).



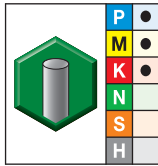
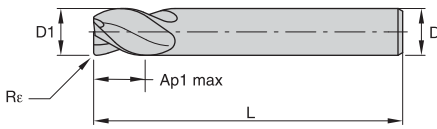
grade TiAlN
TiAlN

- first choice
- alternate choice

order #	D1	D	length of cut Ap1 max	length L	Re
6286059	1/16	1/8	1/8	1 1/2	.010
6286060	1/16	1/8	1/8	1 1/2	.015
6286101	3/32	1/8	3/8	1 1/2	.010
6286102	3/32	1/8	3/8	1 1/2	.015
6286103	1/8	1/8	1/2	1 1/2	.010
6286104	1/8	1/8	1/2	1 1/2	.015
6286105	1/8	1/8	1/2	1 1/2	.020
6286106	1/8	1/8	1/2	1 1/2	.030
6286107	3/16	3/16	5/8	2	.010
6286108	3/16	3/16	5/8	2	.015
6286109	3/16	3/16	5/8	2	.020
6286110	3/16	3/16	5/8	2	.030
6286131	1/4	1/4	3/4	2 1/2	.015
6286132	1/4	1/4	3/4	2 1/2	.020
6286133	1/4	1/4	3/4	2 1/2	.030
6286134	1/4	1/4	3/4	2 1/2	.045
6286135	1/4	1/4	3/4	2 1/2	.060
6286136	5/16	5/16	13/16	2 1/2	.015
6286137	5/16	5/16	13/16	2 1/2	.020
6286138	5/16	5/16	13/16	2 1/2	.030
6286139	5/16	5/16	13/16	2 1/2	.045
6286140	5/16	5/16	13/16	2 1/2	.060
6286151	3/8	3/8	1	2 1/2	.015
6286152	3/8	3/8	1	2 1/2	.020
6286153	3/8	3/8	1	2 1/2	.030
6286154	3/8	3/8	1	2 1/2	.045
6286155	3/8	3/8	1	2 1/2	.060
6286763	1/2	1/2	1	3	.015

(continued)

(Series I2R • 2-Flute Radius-Style End Mills — continued)



● first choice
○ alternate choice

order #	D1	D	length of cut Ap1 max	length L	Re
6286764	1/2	1/2	1	3	.020
6286765	1/2	1/2	1	3	.030
6286766	1/2	1/2	1	3	.045
6286767	1/2	1/2	1	3	.060
6286768	5/8	5/8	1 1/4	3 1/2	.015
6286769	5/8	5/8	1 1/4	3 1/2	.020
6286770	5/8	5/8	1 1/4	3 1/2	.030
6286811	5/8	5/8	1 1/4	3 1/2	.045
6286812	5/8	5/8	1 1/4	3 1/2	.060
6286813	5/8	5/8	1 1/4	3 1/2	.090
6286814	5/8	5/8	1 1/4	3 1/2	.120
6286815	3/4	3/4	1 1/2	4	.015
6286816	3/4	3/4	1 1/2	4	.020
6286817	3/4	3/4	1 1/2	4	.030
6286818	3/4	3/4	1 1/2	4	.045
6286819	3/4	3/4	1 1/2	4	.060
6286820	3/4	3/4	1 1/2	4	.090
6286821	3/4	3/4	1 1/2	4	.125
6286822	7/8	7/8	1 1/2	4	.015
6286823	7/8	7/8	1 1/2	4	.020
6286824	7/8	7/8	1 1/2	4	.030
6286825	7/8	7/8	1 1/2	4	.045
6286826	7/8	7/8	1 1/2	4	.060
6286827	7/8	7/8	1 1/2	4	.090
6286828	7/8	7/8	1 1/2	4	.125
6286829	1	1	1 1/2	4	.015
6286830	1	1	1 1/2	4	.020
6286851	1	1	1 1/2	4	.030
6286852	1	1	1 1/2	4	.045
6286853	1	1	1 1/2	4	.060
6286854	1	1	1 1/2	4	.090
6286855	1	1	1 1/2	4	.125

NOTE: For application data, please see page 12.

■ Series I2S..S I2S..R I2R... • TiAlN • 2-Flute Square-End and Radius-Style End Mills

Material Group	Side Milling (A) and Slotting (B)		TiAlN		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.																	
	A		B		Cutting Speed – vc SFM		D1 – Diameter															
	ap	ae	ap	ap	min	max	frac.	1/64	1/32	1/16	5/64	3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
	ap	ae	ap	ap	min	max	dec.	.0156	.0313	.0625	.0781	.0938	.1250	.1875	.2500	.3125	.3750	.5000	.6250	.7500	1.0000	
P	0	Ap1 max	0.1 x D	0.5 x D	490	– 660	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
	1	Ap1 max	0.1 x D	0.5 x D	490	– 660	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
	2	Ap1 max	0.1 x D	0.5 x D	460	– 620	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
	3	Ap1 max	0.1 x D	0.5 x D	390	– 520	IPT	.0001	.0002	.0004	.0004	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045	
M	4	Ap1 max	0.1 x D	0.5 x D	300	– 490	IPT	.0001	.0002	.0003	.0004	.0005	.0007	.0010	.0014	.0017	.0020	.0026	.0030	.0034	.0039	
	1	Ap1 max	0.1 x D	0.5 x D	300	– 380	IPT	.0001	.0002	.0004	.0004	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045	
K	2	Ap1 max	0.1 x D	0.5 x D	200	– 260	IPT	.0001	.0001	.0003	.0004	.0004	.0006	.0009	.0012	.0016	.0018	.0023	.0027	.0031	.0036	
	1	Ap1 max	0.1 x D	0.5 x D	390	– 490	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
K	2	Ap1 max	0.1 x D	0.5 x D	360	– 460	IPT	.0001	.0002	.0004	.0004	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045	



NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ Series I2S..S I2S..R • Uncoated • 2-Flute Square-End End Mills

Material Group	Side Milling (A) and Slotting (B)		uncoated		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.																	
	A		B		Cutting Speed – vc SFM		D1 – Diameter															
	ap	ae	ap	ap	min	max	frac.	1/64	1/32	1/16	5/64	3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
	ap	ae	ap	ap	min	max	dec.	.0156	.0313	.0625	.0781	.0938	.1250	.1875	.2500	.3125	.3750	.5000	.6250	.7500	1.0000	
P	0	Ap1 max	0.1 x D	0.5 x D	390	– 520	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
	1	Ap1 max	0.1 x D	0.5 x D	390	– 520	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
	2	Ap1 max	0.1 x D	0.5 x D	370	– 500	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	



NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ Series I2S..L I2S..X • TiAlN • 2-Flute Square-End End Mills

																					
		Side Milling (A)		TiAlN			Recommended feed per tooth (IPT = inch/th) for side milling (A).														
		A		Cutting Speed – vc SFM			D1 – Diameter														
							frac.	1/16	5/64	3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1		
Material Group	ap	ae	min		max	dec.	.0625	.0781	.0938	.1250	.1875	.2500	.3125	.3750	.5000	.6250	.7500	1.0000			
P	0	Ap1 max	0.1 x D	490	–	660	IPT	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049		
	1	Ap1 max	0.1 x D	490	–	660	IPT	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049		
	2	Ap1 max	0.1 x D	460	–	620	IPT	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049		
	3	Ap1 max	0.1 x D	390	–	520	IPT	.0004	.0004	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045		
M	4	Ap1 max	0.1 x D	300	–	490	IPT	.0003	.0004	.0005	.0007	.0010	.0014	.0017	.0020	.0026	.0030	.0034	.0039		
	1	Ap1 max	0.1 x D	300	–	380	IPT	.0004	.0004	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045		
K	2	Ap1 max	0.1 x D	200	–	260	IPT	.0003	.0004	.0004	.0006	.0009	.0012	.0016	.0018	.0023	.0027	.0031	.0036		
	1	Ap1 max	0.1 x D	390	–	490	IPT	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049		
	2	Ap1 max	0.1 x D	360	–	460	IPT	.0004	.0004	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045		

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ Series I2S..L I2S..X • Uncoated • 2-Flute Square-End End Mills

																					
		Side Milling (A)		uncoated			Recommended feed per tooth (IPT = inch/th) for side milling (A).														
		A		Cutting Speed – vc SFM			D1 – Diameter														
							frac.	1/16	5/64	3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1		
Material Group	ap	ae	min		max	dec.	.0625	.0781	.0938	.1250	.1875	.2500	.3125	.3750	.5000	.6250	.7500	1.0000			
P	0	Ap1 max	0.1 x D	390	–	520	IPT	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049		
	1	Ap1 max	0.1 x D	390	–	520	IPT	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049		
	2	Ap1 max	0.1 x D	370	–	500	IPT	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049		

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ Series I2B..S I2B..R • TiAlN • 2-Flute Ball Nose End Mills

Material Group	Side Milling (A) and Slotting (B)		TiAlN		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.																
	A		B		Cutting Speed – vc SFM	D1 – Diameter															
	ap	ae	ap	ap		frac.	1/64	1/32	1/16	5/64	3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
	ap	ae	ap	ap	min	max	dec.	.0156	.0313	.0625	.0781	.0938	.1250	.1875	.2500	.3125	.3750	.5000	.6250	.7500	1.0000
P	0	Ap1 max	0.1 x D	0.5 x D	490	– 660	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	1	Ap1 max	0.1 x D	0.5 x D	490	– 660	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	2	Ap1 max	0.1 x D	0.5 x D	460	– 620	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	3	Ap1 max	0.1 x D	0.5 x D	390	– 520	IPT	.0001	.0002	.0004	.0004	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045
M	1	Ap1 max	0.1 x D	0.5 x D	300	– 490	IPT	.0001	.0002	.0003	.0004	.0005	.0007	.0010	.0014	.0017	.0020	.0026	.0030	.0034	.0039
	2	Ap1 max	0.1 x D	0.5 x D	300	– 380	IPT	.0001	.0002	.0004	.0004	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045
K	1	Ap1 max	0.1 x D	0.5 x D	200	– 260	IPT	.0001	.0001	.0003	.0004	.0004	.0006	.0009	.0012	.0016	.0018	.0023	.0027	.0031	.0036
	2	Ap1 max	0.1 x D	0.5 x D	390	– 490	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	1	Ap1 max	0.1 x D	0.5 x D	360	– 460	IPT	.0001	.0002	.0004	.0004	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045
	2	Ap1 max	0.1 x D	0.5 x D	360	– 460	IPT	.0001	.0002	.0004	.0004	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ Series I2B..S I2B..R • Uncoated • 2-Flute Ball Nose End Mills

Material Group	Side Milling (A) and Slotting (B)		uncoated		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.																
	A		B		Cutting Speed – vc SFM	D1 – Diameter															
	ap	ae	ap	ap		frac.	1/64	1/32	1/16	5/64	3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
	ap	ae	ap	ap	min	max	dec.	.0156	.0313	.0625	.0781	.0938	.1250	.1875	.2500	.3125	.3750	.5000	.6250	.7500	1.0000
P	0	Ap1 max	0.1 x D	0.5 x D	390	– 520	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	1	1.25 x D	0.1 x D	0.5 x D	390	– 520	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	2	1.25 x D	0.1 x D	0.5 x D	370	– 500	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ Series I2B..L I2B..X • TiAlN • 2-Flute Ball Nose End Mills

Material Group	Side Milling (A)		TiAlN		Recommended feed per tooth (IPT = inch/th) for side milling (A).												
	A		Cutting Speed – vc SFM			frac.	D1 – Diameter										
	ap	ae	min	max	dec.		3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
P	0	Ap1 max	0.1 x D	490	–	660	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	1	Ap1 max	0.1 x D	490	–	660	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	2	Ap1 max	0.1 x D	460	–	620	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	3	Ap1 max	0.1 x D	390	–	520	IPT	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045
M	4	Ap1 max	0.1 x D	300	–	490	IPT	.0005	.0007	.0010	.0014	.0017	.0020	.0026	.0030	.0034	.0039
	1	Ap1 max	0.1 x D	300	–	380	IPT	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045
K	2	Ap1 max	0.1 x D	200	–	260	IPT	.0004	.0006	.0009	.0012	.0016	.0018	.0023	.0027	.0031	.0036
	1	Ap1 max	0.1 x D	390	–	490	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	2	Ap1 max	0.1 x D	360	–	460	IPT	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ Series I2B..L I2B..X • Uncoated • 2-Flute Ball Nose End Mills

Material Group	Side Milling (A)		uncoated		Recommended feed per tooth (IPT = inch/th) for side milling (A).												
	A		Cutting Speed – vc SFM			frac.	D1 – Diameter										
	ap	ae	min	max	dec.		3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
P	0	Ap1 max	0.1 x D	390	–	520	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	1	1.25 x D	0.1 x D	390	–	520	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	2	1.25 x D	0.1 x D	370	–	500	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

3-Flute General Purpose End Mills

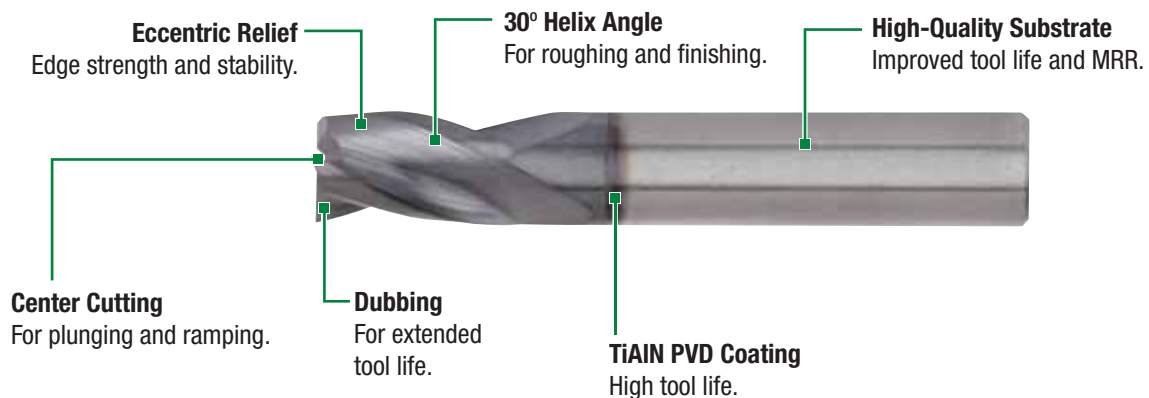
General Purpose End Mills



WIDIA-Hanita™ General Purpose End Mills offer plunging, slotting, and profiling for a wide range of materials and applications. Designed to provide high metal removal rates and excellent surface conditions at a value price. A wide range of diameters and lengths in sharp edge are available from stock.

3-Flute General Purpose End Mills

- General purpose tools for a wide range of workpiece materials.
- Roughing and finishing with one tool.
- Various lengths-of-cut and overall lengths with different front end designs available.
- Three flutes for slotting in unstable conditions.



3-Flute General Purpose End Mills

- Increased manufacturing flexibility and reduced tool cost.
- Fewer tool changes and high Metal Removal Rates (MRR).
- Eccentric relief for improved edge stability and high tool life.
- Easy and cost-efficient regrinding due to eccentric relief.

Series I3S..S

- Center cutting.
- Short length-of-cut and overall length for ramping applications.
- Steel, stainless, and cast iron.
- Sharp edge with dubbing for extended tool life.



Series I3S..R

- Center cutting.
- Regular length-of-cut and overall length for ramping and slotting applications.
- Steel, stainless, and cast iron.
- Sharp edge with dubbing for extended tool life.

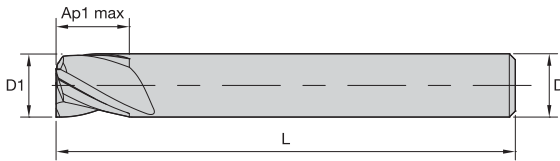


Series I3S..L/I3S..X

- Center cutting.
- Long and extra long length-of-cut and overall length for side milling applications.
- Steel, stainless, and cast iron.
- Sharp edge with dubbing for extended tool life.



- Center cutting.

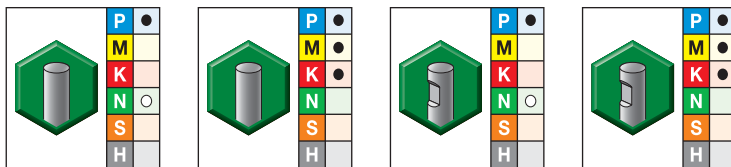


End Mill Tolerances

D1	tolerance e8	D	tolerance h6 + / -
≤ 3	-0,014/-0,028	≤ 3	0/0,006
> 3-6	-0,020/-0,038	> 3-6	0/0,008
> 6-10	-0,025/-0,047	> 6-10	0/0,009
> 10-18	-0,032/-0,059	> 10-18	0/0,011
> 18-30	-0,040/-0,073	> 18-30	0/0,013

■ Series I3S • 3-Flute Square-End End Mills

To access the most up-to-date All-Star products in this portfolio, scan here.

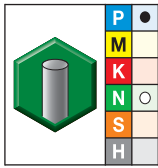
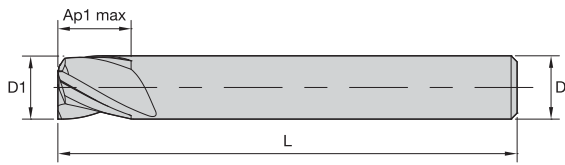


- first choice
- alternate choice

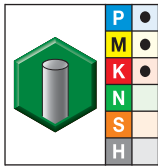
order #	order #	order #	order #	D1	D	length of cut Ap1 max	length L
6144206	6144077	—	—	1/32	1/8	5/64	1 1/2
6144208	6144079	—	—	1/16	1/8	3/16	1 1/2
6144209	6144080	—	—	5/64	1/8	7/64	1 1/2
6144210	6144141	—	—	3/32	1/8	3/8	1 1/2
6144231	6144142	—	—	7/64	1/8	3/8	1 1/2
6144232	6144143	—	—	1/8	1/8	1/4	1 1/2
6144233	6144144	—	—	1/8	1/8	1/2	2 1/2
6144234	6144145	—	—	1/8	1/8	5/8	3
6144236	6144147	—	—	5/32	3/16	9/16	2
6144237	6144148	—	—	3/16	3/16	5/16	2
6144238	6144149	—	—	3/16	3/16	9/16	2
6144239	6144150	—	—	3/16	3/16	5/8	3
6144240	6144151	—	—	3/16	3/16	1	4
6144242	6144153	—	—	7/32	1/4	5/8	2 1/2
6144243	6144154	—	—	7/32	1/4	3/4	2 1/2
6144244	6144155	—	—	1/4	1/4	1/2	2
6144245	6144156	—	—	1/4	1/4	3/4	2 1/2
6144246	6144157	—	—	1/4	1/4	1	3
6144247	6144158	—	—	1/4	1/4	1 1/2	4
6144249	6144159	—	—	9/32	5/16	3/4	2 1/2
6144250	6144161	—	—	9/32	5/16	13/16	2 1/2
6144262	6144163	—	—	5/16	5/16	1/2	2
6144264	6144165	—	—	5/16	5/16	13/16	2 1/2
6144272	6144183	—	—	3/8	3/8	1/2	2
6144275	6144185	—	—	3/8	3/8	7/8	2 1/2
6144277	6144187	—	—	3/8	3/8	1	2 1/2
6144279	6144189	—	—	3/8	3/8	1 1/8	3
6144281	6144192	—	—	7/16	7/16	5/8	2 1/2

(continued)

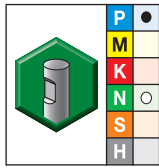
(Series I3S • 3-Flute Square-End End Mills – continued)



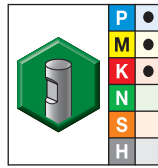
grade UNCOATED



grade TiAlN
TiAlN



grade UNCOATED



grade TiAlN
TiAlN

● first choice
○ alternate choice

order #	order #	order #	order #	D1	D	length of cut Ap1 max	length L
6144282	6144193	—	—	7/16	7/16	7/8	2 1/2
6144283	6144194	—	—	7/16	7/16	1	2 1/2
6144284	6144195	—	—	1/2	1/2	1	3
6144285	6144196	6144261	6144162	1/2	1/2	2	4
6144287	6144198	6144265	6144166	9/16	5/8	1 1/8	3 1/2
6144288	6144199	6144267	6144168	5/8	5/8	3/4	3
6144289	6144200	6144269	6144170	5/8	5/8	1 1/4	3 1/2
6144290	6144201	6144271	6144182	3/4	3/4	1	3
6144291	6144202	6144273	6144184	3/4	3/4	1 1/2	4
6144292	6144203	6144274	6144186	3/4	3/4	2 1/4	5
6144293	6144204	—	—	1	1	1 1/2	4
6144294	6144205	6144278	6144190	1	1	2 1/4	5

NOTE: For application data, please see pages 20–21.

■ Series I3S..S I3S..R • TiAlN • 3-Flute Square-End End Mills

Material Group	Side Milling (A) and Slotting (B)		TiAlN		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.												
	A		B	Cutting Speed – vc SFM			frac.	D1 – Diameter									
	ap	ae	ap	min		max		1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
	ap	ae	ap	min		max	dec.	.1250	.1875	.2500	.3125	.3750	.5000	.6250	.7500	1.0000	
P	0	2.0 x D	0.1 x D	0.5 x D	490	–	660	IPT	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	1	2.0 x D	0.1 x D	0.5 x D	490	–	660	IPT	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	2	2.0 x D	0.1 x D	0.5 x D	460	–	620	IPT	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	3	2.0 x D	0.1 x D	0.5 x D	390	–	520	IPT	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045
M	1	2.0 x D	0.1 x D	0.5 x D	300	–	490	IPT	.0007	.0010	.0014	.0017	.0020	.0026	.0030	.0034	.0039
	2	2.0 x D	0.1 x D	0.5 x D	200	–	260	IPT	.0006	.0009	.0012	.0016	.0018	.0023	.0027	.0031	.0036
K	1	2.0 x D	0.1 x D	0.5 x D	390	–	490	IPT	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	2	2.0 x D	0.1 x D	0.5 x D	360	–	460	IPT	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045



NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters >1/2".

■ Series I3S..S I3S..R • Uncoated • 3-Flute Square-End End Mills

Material Group	Side Milling (A) and Slotting (B)		uncoated		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.												
	A		B	Cutting Speed – vc SFM			frac.	D1 – Diameter									
	ap	ae	ap	min		max		1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
	ap	ae	ap	min		max	dec.	.1250	.1875	.2500	.3125	.3750	.5000	.6250	.7500	1.0000	
P	0	2.0 x D	0.1 x D	0.5 x D	490	–	660	IPT	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	1	2.0 x D	0.1 x D	0.5 x D	490	–	660	IPT	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	2	2.0 x D	0.1 x D	0.5 x D	460	–	620	IPT	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
N	1	Ap1 max	0.1 x D	0.5 x D	650	–	2600	IPT	.0013	.0019	.0025	.0031	.0038	.0050	.0063	.0075	.0100
	2	Ap1 max	0.1 x D	0.5 x D	650	–	2000	IPT	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0060	.0080
	5	Ap1 max	0.1 x D	0.5 x D	650	–	2000	IPT	.0011	.0017	.0023	.0028	.0034	.0045	.0056	.0068	.0090



NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters >1/2".

■ Series I3S..L I3S..X • TiAlN • 3-Flute Square-End End Mills

																
		Side Milling (A)		TiAlN			Recommended feed per tooth (IPT = inch/th) for side milling (A).									
Material Group	A		Cutting Speed – vc SFM			frac. dec.	D1 – Diameter									
	ap	ae	min		max		1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
P	0	2.0 x D	0.1 x D	490	–	660	IPT	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	1	2.0 x D	0.1 x D	490	–	660	IPT	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	2	2.0 x D	0.1 x D	460	–	620	IPT	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	3	2.0 x D	0.1 x D	390	–	520	IPT	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045
	4	2.0 x D	0.1 x D	300	–	490	IPT	.0007	.0010	.0014	.0017	.0020	.0026	.0030	.0034	.0039
M	1	2.0 x D	0.1 x D	300	–	380	IPT	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045
	2	2.0 x D	0.1 x D	200	–	260	IPT	.0006	.0009	.0012	.0016	.0018	.0023	.0027	.0031	.0036
K	1	2.0 x D	0.1 x D	390	–	490	IPT	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	2	2.0 x D	0.1 x D	360	–	460	IPT	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters >1/2".

■ Series I3S..L I3S..X • Uncoated • 3-Flute Square-End End Mills

																
		Side Milling (A)		uncoated			Recommended feed per tooth (IPT = inch/th) for side milling (A).									
Material Group	A		Cutting Speed – vc SFM			frac. dec.	D1 – Diameter									
	ap	ae	min		max		1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
P	0	2.0 x D	0.1 x D	490	–	660	IPT	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	1	2.0 x D	0.1 x D	490	–	660	IPT	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	2	2.0 x D	0.1 x D	460	–	620	IPT	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
N	1	Ap1 max	0.1 x D	650	–	2600	IPT	.0013	.0019	.0025	.0031	.0038	.0050	.0063	.0075	.0100
	2	Ap1 max	0.1 x D	650	–	2000	IPT	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0060	.0080
	5	Ap1 max	0.1 x D	650	–	2000	IPT	.0011	.0017	.0023	.0028	.0034	.0045	.0056	.0068	.0090

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters >1/2".

4-Flute General Purpose End Mills

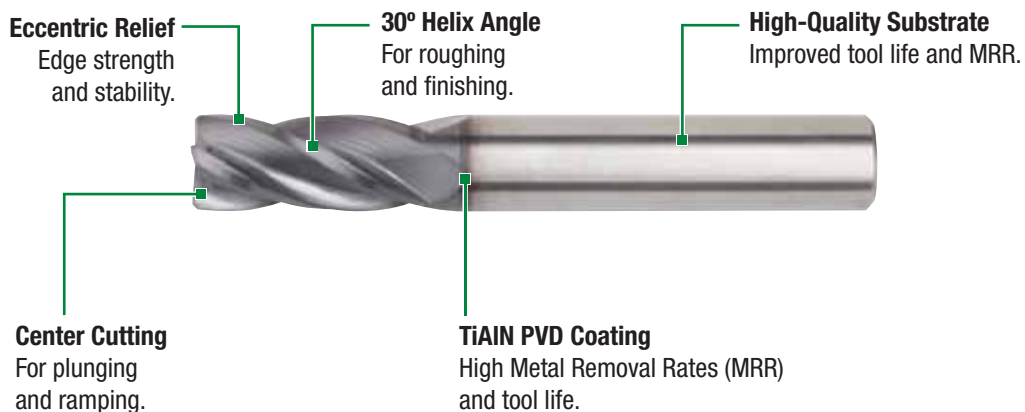
General Purpose End Mills



WIDIA-Hanita™ General Purpose End Mills offer plunging, slotting, and profiling for a wide range of materials and applications. Designed to provide high metal removal rates and excellent surface conditions at a value price. A wide range of diameters, lengths, and corner styles (such as chamfered, sharp edge, and ball nose) are available from stock.

4-Flute General Purpose End Mills

- General purpose tools for a wide range of workpiece materials.
- Roughing and finishing with one tool.
- Various lengths-of-cut and overall lengths with different front-end designs available.
- Four flutes for high Metal Removal Rates (MRR) and tool life.



4-Flute General Purpose End Mills

- Increased manufacturing flexibility and reduced tooling cost.
- Less tool changes and high Metal Removal Rates (MRR).
- One tool required for roughing and finishing.
- Eccentric relief for improved edge stability and high tool life.
- Easy and cost-efficient regrinding due to eccentric relief.

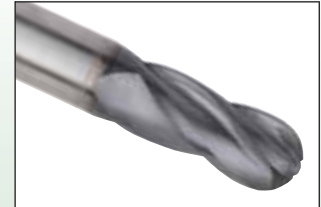
Series I4S

- Wide range of lengths-of-cut — short, regular, long, and extra long.
- Steel, stainless steel, and cast iron.



Series I4B

- Wide range of lengths-of-cut — short, regular, long, and extra long.
- Steel, stainless steel, and cast iron.
- Center cut ball nose.

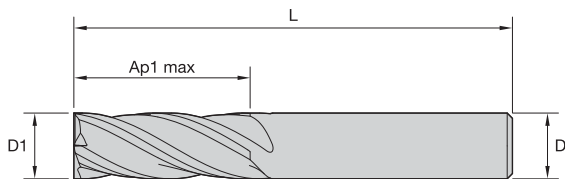
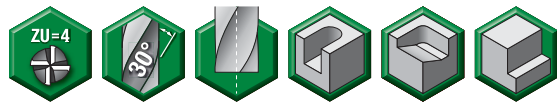


Series I4R

- Regular length-of-cut with corner radius.
- Steel, stainless steel, and cast iron.
- Center cut.



- Center cutting.
- Sharp corners.
- Standard items listed. Additional styles and coatings made-to-order.

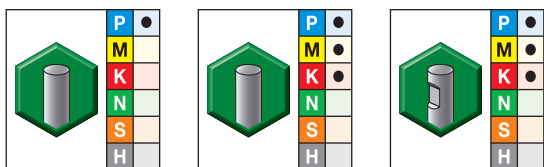


End Mill Tolerances

D1	tolerance e8	D	tolerance h6 + / -
All	+0.000/-0.002	≤ 1/8"	0/0.00024
		> 1/8-1/4"	0/0.00031
		> 1/4-3/8"	0/0.00035
		> 3/8-23/32"	0/0.00043
		> 23/32-1 3/16"	0/0.00051

■ Series I4S • 4-Flute Square-End End Mills

To access the most up-to-date All-Star products in this portfolio, scan here.

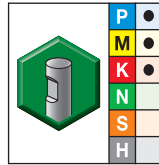
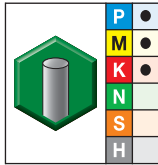
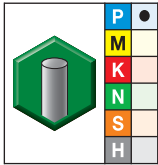
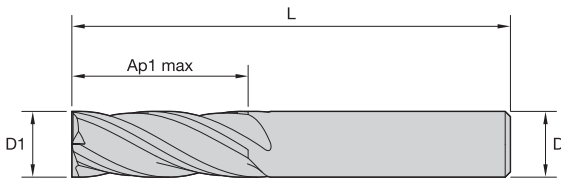


- first choice
- alternate choice

order #	order #	order #	D1	D	length of cut Ap1 max	length L
—	5879053	—	1/64	1/8	1/32	1 1/2
—	5879054	—	1/32	1/8	5/64	1 1/2
5879198	5879055	—	1/16	1/8	7/64	1 1/2
5879199	5879056	—	5/64	1/8	3/16	1 1/2
5879200	5879057	—	3/32	1/8	3/8	1 1/2
—	5879058	—	3/32	1/8	5/8	2
—	5879059	—	7/64	1/8	3/8	1 1/2
—	5879060	—	1/8	1/8	1/4	1 1/2
5879201	5879131	—	1/8	1/8	1/2	1 1/2
—	5879132	—	1/8	1/8	3/4	2 1/4
5879202	5879133	—	1/8	1/8	1	3
—	5879134	—	9/64	3/16	9/16	2
—	5879135	—	5/32	3/16	9/16	2
5879203	5879136	—	3/16	3/16	5/8	2
—	5879137	—	3/16	3/16	3/4	1 1/2
—	5879138	—	3/16	3/16	3/4	2 1/2
5879204	5879139	—	3/16	3/16	1 1/8	3
—	5879140	—	3/16	3/16	1 1/8	3 1/4
—	5879141	—	13/64	1/4	5/8	2 1/2
—	5879142	—	7/32	1/4	7/16	2
—	5879143	—	7/32	1/4	5/8	2 1/2
—	5879144	—	15/64	1/4	3/4	2 1/2
5879205	5879145	—	1/4	1/4	1/2	2
5879206	5879146	—	1/4	1/4	3/4	2 1/2
5879207	5879147	—	1/4	1/4	1 1/8	3
5879208	5879148	—	1/4	1/4	1 1/2	4
—	5879149	—	17/64	5/16	3/4	2 1/2
—	5879150	—	9/32	5/16	3/4	2 1/2
—	5879151	—	19/64	5/16	13/16	2 1/2
5879209	5879152	—	5/16	5/16	1/2	2
5879210	5879153	—	5/16	5/16	13/16	2 1/2
5879211	5879154	—	5/16	5/16	1 1/8	3

(continued)

(Series I4S • 4-Flute Square-End End Mills – continued)

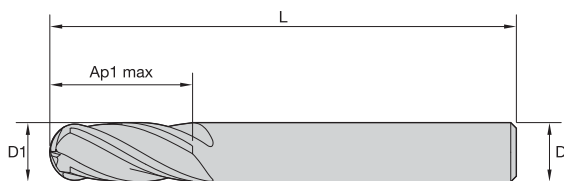


● first choice
○ alternate choice

grade UNCOATED	grade TiAlN TiAlN	grade TiAlN TiAlN	D1	D	length of cut Ap1 max	length L
order #	order #	order #				
5879212	5879155	—	5/16	5/16	1 5/8	4
—	5879156	—	21/64	3/8	1	2 1/2
—	5879157	—	11/32	3/8	1	2 1/2
—	5879158	—	23/64	3/8	1	2 1/2
5879213	5879159	—	3/8	3/8	5/8	2
5879214	5879160	—	3/8	3/8	1	2 1/2
5879215	5879161	—	3/8	3/8	1 1/8	3
5879216	5879162	—	3/8	3/8	1 3/4	4
—	5879163	—	25/64	7/16	1	2 3/4
—	5879164	—	13/32	7/16	1	2 3/4
—	5879165	—	27/64	7/16	1	2 3/4
5879217	5879166	—	7/16	7/16	1	2 1/2
—	5879167	—	7/16	7/16	1	2 3/4
5879218	5879168	—	7/16	7/16	2	4
5879219	5879169	—	7/16	7/16	3	6
—	5879170	—	29/64	1/2	1	3
—	5879171	—	15/32	1/2	1	3
—	5879172	—	31/64	1/2	1	3
5879220	5879173	—	1/2	1/2	5/8	2 1/2
5879221	5879174	5879527	1/2	1/2	1	3
5879222	5879175	5879528	1/2	1/2	2	4
5879223	5879176	5879529	1/2	1/2	3	6
5879224	5879177	5879530	9/16	9/16	3/4	3
5879225	5879178	5879551	9/16	9/16	1 1/4	3 1/2
5879226	5879179	5879552	9/16	9/16	2 1/4	5
5879227	5879180	5879553	5/8	5/8	3/4	3
5879228	5879181	5879554	5/8	5/8	1 1/4	3 1/2
5879229	5879182	5879555	5/8	5/8	2 1/4	5
5879230	5879183	5879556	5/8	5/8	4	7
—	5879184	—	11/16	3/4	1 3/8	4
5879241	5879185	—	3/4	3/4	1	3
5879242	5879186	5879558	3/4	3/4	1 1/2	4
5879243	5879187	5879559	3/4	3/4	2 1/4	5
5879244	5879188	5879560	3/4	3/4	3	6
5879245	5879189	5879561	3/4	3/4	4	7
—	5879190	—	13/16	7/8	1 1/2	4
5879246	5879191	5879562	7/8	7/8	1 1/2	4
5879247	5879192	5879563	7/8	7/8	2 1/4	5
5879248	5879193	—	1	1	1 1/2	4
5879249	5879194	5879565	1	1	2 1/4	5
5879250	5879195	5879566	1	1	3	6
5879261	5879196	5879567	1	1	4	7
5879262	5879197	—	1 1/4	1 1/4	2	4 1/2

NOTE: For application data, please see pages 30–31.

- Center cutting.
- Standard items listed. Additional styles and coatings made-to-order.

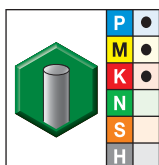


End Mill Tolerances

D1	tolerance e8	D	tolerance h6 + / -
All	+0.000/-0.002	≤ 1/8"	0/0.00024
		> 1/8-1/4"	0/0.00031
		> 1/4-3/8"	0/0.00035
		> 3/8-23/32"	0/0.00043
		> 23/32-1 3/16"	0/0.00051

■ Series I4B • 4-Flute Ball Nose End Mills

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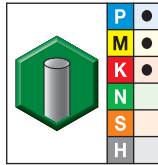
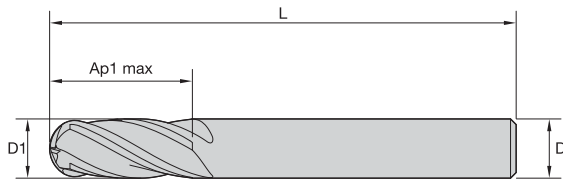
grade TiAlN
TiAlN

- first choice
- alternate choice

order #	D1	D	length of cut Ap1 max	length L
5825624	1/32	1/8	5/64	1 1/2
5825625	3/64	1/8	1/8	1 1/2
5825626	1/16	1/8	3/16	1 1/2
5825627	5/64	1/8	3/16	1 1/2
5825628	3/32	1/8	3/16	1 1/2
5825643	3/32	1/8	3/8	1 1/2
5825645	7/64	1/8	3/8	1 1/2
5825646	1/8	1/8	1/4	1 1/2
5825647	1/8	1/8	1/2	1 1/2
5825648	1/8	1/8	3/4	2 1/4
5825649	1/8	1/8	3/4	3
5825650	9/64	3/16	9/16	2
5825651	5/32	3/16	5/16	2
5825652	5/32	3/16	9/16	2
5825653	11/64	3/16	5/8	2
5825654	3/16	3/16	5/16	1 1/2
5825655	3/16	3/16	5/8	2
5825656	3/16	3/16	3/4	2 1/2
5825657	3/16	3/16	1	4
5825658	13/64	1/4	5/8	2 1/2
5825659	7/32	1/4	5/8	2 1/2
5825660	15/64	1/4	3/4	2 1/2
5825661	1/4	1/4	1/2	2
5825663	1/4	1/4	3/4	2 1/2
5825664	1/4	1/4	1 1/8	3
5825665	1/4	1/4	1 1/2	4
5825666	1/4	1/4	1 1/2	6
5825667	17/64	5/16	3/4	2 1/2

(continued)

(Series I4B • 4-Flute Ball Nose End Mills — continued)

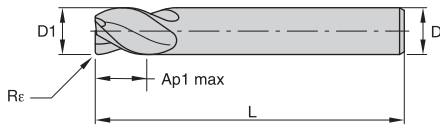
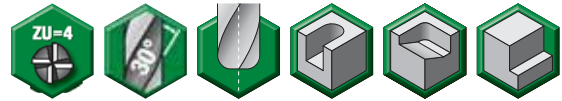


● first choice
○ alternate choice

order #	D1	D	length of cut Ap1 max	length L
5825668	9/32	5/16	3/4	2 1/2
5825669	5/16	5/16	1/2	2
5825670	5/16	5/16	13/16	2 1/2
5825681	5/16	5/16	1 1/8	3
5825682	5/16	5/16	1 5/8	4
5825683	11/32	3/8	1	2 1/2
5825684	3/8	3/8	1	2 1/2
5825685	3/8	3/8	1	4
5825686	3/8	3/8	1 1/8	3
5825687	3/8	3/8	1 1/2	6
5825688	7/16	1/2	1	2 1/2
5825689	1/2	1/2	1	3
5825690	1/2	1/2	1	4
5825691	1/2	1/2	1 1/2	6
5825693	1/2	1/2	2	4 1/2
5825692	1/2	1/2	2	4
5825694	1/2	1/2	3	6
5825695	9/16	9/16	1 1/4	3 1/2
5825696	5/8	5/8	3/4	3
5825697	5/8	5/8	1 1/4	3 1/2
5825698	5/8	5/8	2 1/4	5
5825699	5/8	5/8	3	6
5825700	3/4	3/4	1	3
5825711	3/4	3/4	1 1/2	4
5825712	3/4	3/4	3	6
5825713	7/8	7/8	1 1/2	4
5825714	1	1	1 1/2	4
5825715	1	1	2 1/4	5

NOTE: For application data, please see page 32.

- Center cutting.
- Radius corner.
- Standard items listed. Additional styles and coatings made-to-order.

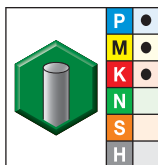


End Mill Tolerances

D1	tolerance e8	D	tolerance h6 + / -
≤ 3	-0,014/-0,028	≤ 3	0/0,006
> 3-6	-0,020/-0,038	> 3-6	0/0,008
> 6-10	-0,025/-0,047	> 6-10	0/0,009
> 10-18	-0,032/-0,059	> 10-18	0/0,011
> 18-30	-0,040/-0,073	> 18-30	0/0,013

■ Series I4R • 4-Flute Radius-Style End Mills

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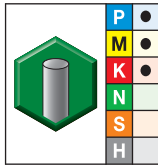
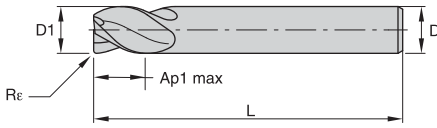
grade TiAlN
TiAlN

- first choice
- alternate choice

order #	D1	D	length of cut Ap1 max	length L	Re
6282423	1/16	1/8	1/8	1 1/2	.010
6282424	1/16	1/8	1/8	1 1/2	.015
6282426	3/32	1/8	3/8	1 1/2	.010
6282427	3/32	1/8	3/8	1 1/2	.015
6282428	1/8	1/8	1/2	1 1/2	.010
6282429	1/8	1/8	1/2	1 1/2	.015
6282430	1/8	1/8	1/2	1 1/2	.020
6282441	1/8	1/8	1/2	1 1/2	.030
6282442	3/16	3/16	5/8	2	.010
6282443	3/16	3/16	5/8	2	.015
6282444	3/16	3/16	5/8	2	.020
6282446	3/16	3/16	5/8	2	.030
6282447	1/4	1/4	3/4	2 1/2	.015
6282448	1/4	1/4	3/4	2 1/2	.020
6282449	1/4	1/4	3/4	2 1/2	.030
6282450	1/4	1/4	3/4	2 1/2	.045
6282461	1/4	1/4	3/4	2 1/2	.060
6282462	5/16	5/16	13/16	2 1/2	.015
6282463	5/16	5/16	13/16	2 1/2	.020
6282464	5/16	5/16	13/16	2 1/2	.030
6282465	5/16	5/16	13/16	2 1/2	.045
6282467	5/16	5/16	13/16	2 1/2	.060
6285506	3/8	3/8	1	2 1/2	.015
6282468	3/8	3/8	1	2 1/2	.020
6282469	3/8	3/8	1	2 1/2	.030
6282470	3/8	3/8	1	2 1/2	.045
6282501	3/8	3/8	1	2 1/2	.060
6282503	1/2	1/2	1	3	.015

(continued)

(Series I4R • 4-Flute Radius-Style End Mills — continued)



● first choice
○ alternate choice

order #	D1	D	length of cut Ap1 max	length L	Re
6282504	1/2	1/2	1	3	.020
6282505	1/2	1/2	1	3	.030
6282506	1/2	1/2	1	3	.045
6282507	1/2	1/2	1	3	.060
6282508	5/8	5/8	1 1/4	3 1/2	.015
6282509	5/8	5/8	1 1/4	3 1/2	.020
6282510	5/8	5/8	1 1/4	3 1/2	.030
6282531	5/8	5/8	1 1/4	3 1/2	.045
6282532	5/8	5/8	1 1/4	3 1/2	.060
6282533	5/8	5/8	1 1/4	3 1/2	.090
6282535	5/8	5/8	1 1/4	3 1/2	.120
6282536	3/4	3/4	1 1/2	4	.015
6282537	3/4	3/4	1 1/2	4	.020
6282538	3/4	3/4	1 1/2	4	.030
6282539	3/4	3/4	1 1/2	4	.045
6282540	3/4	3/4	1 1/2	4	.060
6282561	3/4	3/4	1 1/2	4	.090
6282562	3/4	3/4	1 1/2	4	.125
6282563	7/8	7/8	1 1/2	4	.015
6282564	7/8	7/8	1 1/2	4	.020
6282565	7/8	7/8	1 1/2	4	.030
6282566	7/8	7/8	1 1/2	4	.045
6282567	7/8	7/8	1 1/2	4	.060
6282568	7/8	7/8	1 1/2	4	.090
6282569	7/8	7/8	1 1/2	4	.125
6282570	1	1	1 1/2	4	.015
6282571	1	1	1 1/2	4	.020
6282572	1	1	1 1/2	4	.030
6282573	1	1	1 1/2	4	.045
6282574	1	1	1 1/2	4	.060
6282575	1	1	1 1/2	4	.090
6282576	1	1	1 1/2	4	.125

NOTE: For application data, please see page 30.

■ Series I4R..S I4S..S I4R..R I4S..R • TiAlN • 4-Flute Square-End and Radius-Style End Mills

Material Group																					
	Side Milling (A) and Slotting (B)				TiAlN		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.														
	A		B		Cutting Speed – vc SFM		D1 – Diameter														
	ap	ae	ap	min	max	frac.	1/64	1/32	1/16	5/64	3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
P	0	Ap1 max	0.1 x D	0.5 x D	490 – 660	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
	1	Ap1 max	0.1 x D	0.5 x D	490 – 660	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
	2	Ap1 max	0.1 x D	0.5 x D	460 – 620	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
	3	Ap1 max	0.1 x D	0.5 x D	390 – 520	IPT	.0001	.0002	.0004	.0004	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045	
M	1	Ap1 max	0.1 x D	0.5 x D	300 – 490	IPT	.0001	.0002	.0003	.0004	.0005	.0007	.0010	.0014	.0017	.0020	.0026	.0030	.0034	.0039	
	2	Ap1 max	0.1 x D	0.5 x D	300 – 380	IPT	.0001	.0002	.0004	.0004	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045	
K	1	Ap1 max	0.1 x D	0.5 x D	200 – 260	IPT	.0001	.0001	.0003	.0004	.0004	.0006	.0009	.0012	.0016	.0018	.0023	.0027	.0031	.0036	
	2	Ap1 max	0.1 x D	0.5 x D	390 – 490	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
2	Ap1 max	0.1 x D	0.5 x D	360 – 460	IPT	.0001	.0002	.0004	.0004	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045		



NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ Series I4S..S I4S..R • Uncoated • 4-Flute Square-End End Mills

Material Group																					
	Side Milling (A) and Slotting (B)				uncoated		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.														
	A		B		Cutting Speed – vc SFM		D1 – Diameter														
	ap	ae	ap	min	max	frac.	1/16	5/64	3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1			
P	0	Ap1 max	0.1 x D	0.5 x D	390 – 520	IPT	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049			
	1	1.25 x D	0.1 x D	0.5 x D	390 – 520	IPT	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049			
	2	1.25 x D	0.1 x D	0.5 x D	370 – 500	IPT	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049			



NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ Series I4S..L I4S..X • TiAlN • 4-Flute Square-End End Mills

																		
		Side Milling (A)		TiAlN			Recommended feed per tooth (IPT = inch/th) for side milling (A).											
Material Group	A		Cutting Speed – vc SFM			frac.	D1 – Diameter											
	ap	ae	min		max		dec.	3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
P	0	Ap1 max	0.1 x D	490	–	660	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
	1	Ap1 max	0.1 x D	490	–	660	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
	2	Ap1 max	0.1 x D	460	–	620	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
	3	Ap1 max	0.1 x D	390	–	520	IPT	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045	
M	1	Ap1 max	0.1 x D	300	–	490	IPT	.0005	.0007	.0010	.0014	.0017	.0020	.0026	.0030	.0034	.0039	
	2	Ap1 max	0.1 x D	300	–	380	IPT	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045	
K	1	Ap1 max	0.1 x D	200	–	260	IPT	.0004	.0006	.0009	.0012	.0016	.0018	.0023	.0027	.0031	.0036	
	2	Ap1 max	0.1 x D	390	–	490	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
K	1	Ap1 max	0.1 x D	390	–	490	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
	2	Ap1 max	0.1 x D	360	–	460	IPT	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045	

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ Series I4S..L I4S..X • Uncoated • 4-Flute Square-End End Mills

																		
		Side Milling (A)		uncoated			Recommended feed per tooth (IPT = inch/th) for side milling (A).											
Material Group	A		Cutting Speed – vc SFM			frac.	D1 – Diameter											
	ap	ae	min		max		dec.	3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
P	0	Ap1 max	0.1 x D	390	–	520	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
	1	Ap1 max	0.1 x D	390	–	520	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	
	2	Ap1 max	0.1 x D	370	–	500	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049	

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ Series I4B..S I4B..R • TiAlN • 4-Flute Ball Nose End Mills

Material Group																						
	Side Milling (A) and Slotting (B)			TiAlN		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.																
	A		B	Cutting Speed – vc SFM		frac.	D1 – Diameter															
	ap	ae	ap	min	max		dec.	1/64	1/32	1/16	5/64	3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
P	0	Ap1 max	0.1 x D	0.5 x D	490	–	660	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	1	Ap1 max	0.1 x D	0.5 x D	490	–	660	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	2	Ap1 max	0.1 x D	0.5 x D	460	–	620	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	3	Ap1 max	0.1 x D	0.5 x D	390	–	520	IPT	.0001	.0002	.0004	.0004	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045
	4	Ap1 max	0.1 x D	0.5 x D	300	–	490	IPT	.0001	.0002	.0003	.0004	.0005	.0007	.0010	.0014	.0017	.0020	.0026	.0030	.0034	.0039
M	1	Ap1 max	0.1 x D	0.5 x D	300	–	380	IPT	.0001	.0002	.0004	.0004	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045
	2	Ap1 max	0.1 x D	0.5 x D	200	–	260	IPT	.0001	.0001	.0003	.0004	.0004	.0006	.0009	.0012	.0016	.0018	.0023	.0027	.0031	.0036
K	1	Ap1 max	0.1 x D	0.5 x D	390	–	490	IPT	.0001	.0002	.0004	.0005	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	2	Ap1 max	0.1 x D	0.5 x D	360	–	460	IPT	.0001	.0002	.0004	.0004	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ Series I4B..L I4B..X • TiAlN • 4-Flute Ball Nose End Mills

Material Group																	
	Side Milling (A)		TiAlN		Recommended feed per tooth (IPT = inch/th) for side milling (A).												
	A		Cutting Speed – vc SFM		frac.	D1 – Diameter											
	ap	ae	min	max		dec.	3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
P	0	Ap1 max	0.1 x D	490	–	660	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	1	Ap1 max	0.1 x D	490	–	660	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	2	Ap1 max	0.1 x D	460	–	620	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	3	Ap1 max	0.1 x D	390	–	520	IPT	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045
	4	Ap1 max	0.1 x D	300	–	490	IPT	.0005	.0007	.0010	.0014	.0017	.0020	.0026	.0030	.0034	.0039
M	1	Ap1 max	0.1 x D	300	–	380	IPT	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045
	2	Ap1 max	0.1 x D	200	–	260	IPT	.0004	.0006	.0009	.0012	.0016	.0018	.0023	.0027	.0031	.0036
K	1	Ap1 max	0.1 x D	390	–	490	IPT	.0007	.0009	.0013	.0018	.0023	.0027	.0034	.0039	.0044	.0049
	2	Ap1 max	0.1 x D	360	–	460	IPT	.0005	.0007	.0011	.0015	.0020	.0023	.0029	.0034	.0039	.0045

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

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IMPORTANT SAFETY INSTRUCTIONS: Read before using the tools in this catalog

METALCUTTING SAFETY

Projectile and Fragmentation Hazards

Modern metalcutting operations involve high spindle and cutter speeds and high temperatures and cutting forces. Hot metal chips may fly off the workpiece during metalcutting. Although cutting tools are designed and manufactured to withstand high cutting forces and temperatures, they can sometimes fragment, particularly if they are subjected to over-stress, severe impact, or other abuse.

To avoid injury:

- Always wear appropriate personal protective equipment, including safety goggles, when operating metalcutting machines or working nearby.
- Always make sure all machine guards are in place.

For more information, read the applicable Material Safety Data Sheet provided by WIDIA and consult General Industry Safety and Health Regulations, Part 1910, Title 29 of the Code of Federal Regulations.

These safety instructions are general guidelines. Many variables affect machining operations. It is impossible to cover every specific situation. The technical information included in this catalogue and recommendations on machining practices may not apply to your particular operation.

For more information, consult the WIDIA Metalcutting Safety booklet, available free from WIDIA at +1 724 539 5747 or fax +1 724 539 5439. For specific product safety and environmental questions, contact our Corporate Environmental Health and Safety Office at +1 724 539 5066 or fax +1 724 539 5372.

Breathing and Skin Contact Hazards

Grinding carbide or other advanced cutting tool materials produces dust or mist containing metallic particles. Breathing this dust or mist — especially over an extended period — can cause temporary or permanent lung disease or make existing medical conditions worse. Contact with this dust or mist can irritate eyes, skin, and mucous membranes and may make existing skin conditions worse.

To avoid injury:

- Always wear breathing protection and safety goggles when grinding.
- Provide ventilation control and collect and properly dispose of dust, mist, or sludge from grinding.
- Avoid skin contact with dust or mist.

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