



AEROSPACE



DIE & MOLD



MACHINE TOOL  
INDUSTRY



MEDICAL



**CUTTING TOOLS**  
**END MILLS •**  
**HIGH-PERFORMANCE**  
**CARBIDE DRILLS**

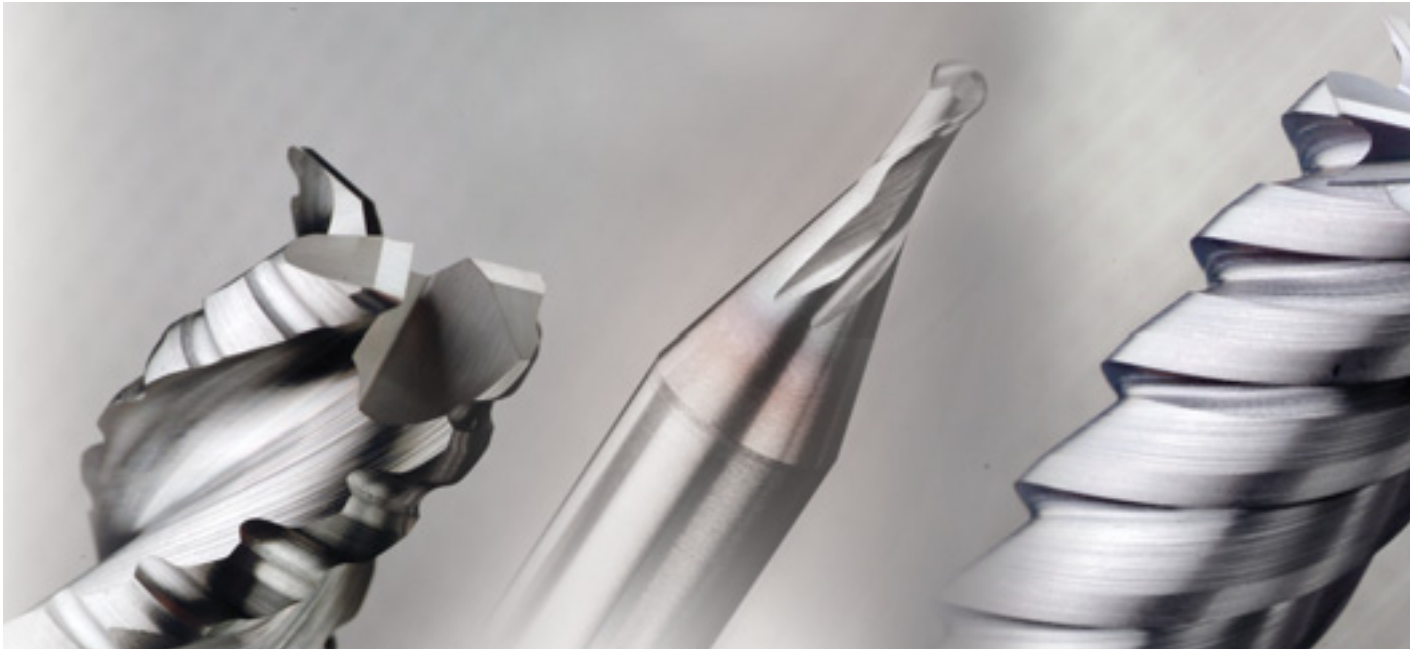


METRIC VERSION





# HANITA CUTTING TOOLS



Hanita Cutting Tools is recognized as one of the world's leading manufacturers of high quality, high performance end mills and carbide drills.

Providing its products, services and technical support through a global network of local distributors and regional service centers, Hanita serves its user customers with state of the art capabilities designed to optimize productivity and throughput.

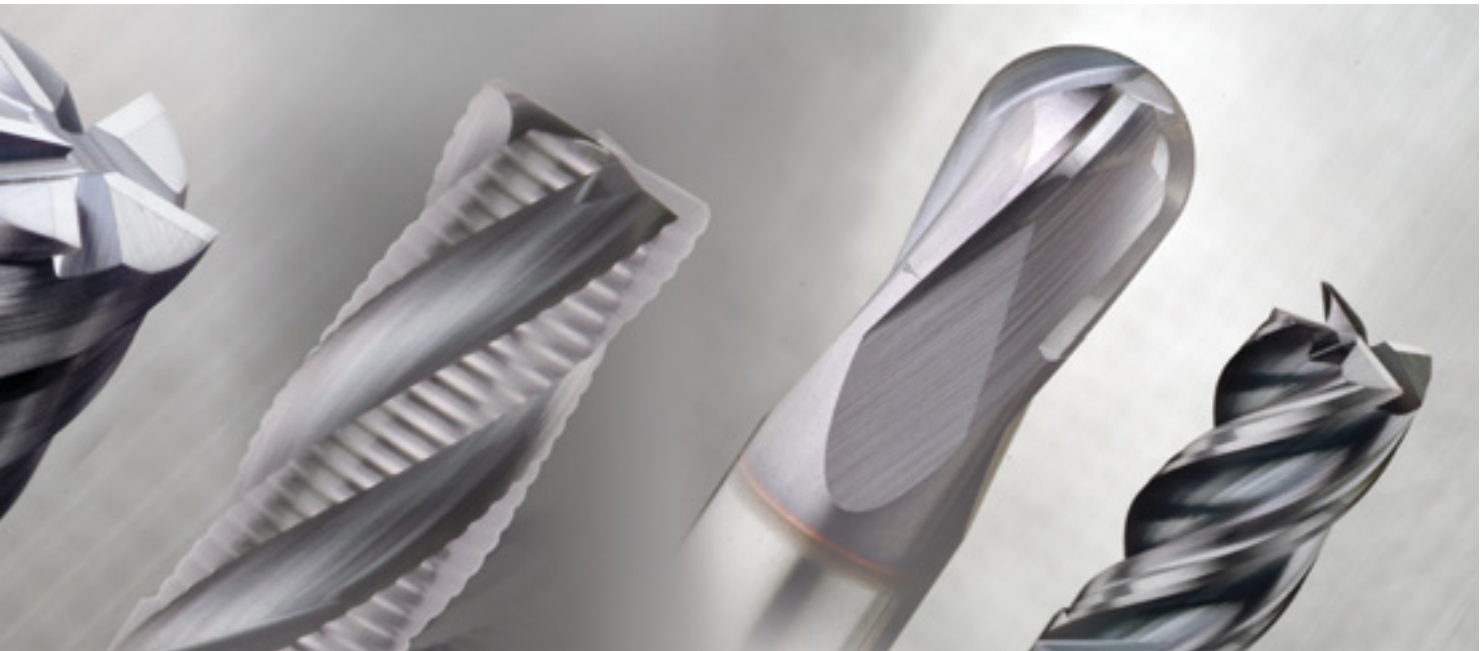
Hanita products are manufactured in a wide range of standard styles, including high performance roughing, semi – finishing and finishing end mills, solid and coolant hole drills and special cutting tools, made from the world's finest quality Sub – Micrograin carbide and premium conventional and powdered metal High Speed Steels. Hanita also provides the widest range of in-house PVD coating capabilities, including TiN, TiCN, TiAlN, AlTiN and Diamond coatings as well as a variety of unique proprietary coatings for special applications. Serving every major industrial market throughout the world, Hanita



manufacturers tools to all known standard specifications, including metric DIN, JIS, NAS 986, Imperial and ANSI requirements and targets to be a vendor of choice to the most demanding industries, including Aerospace, Die and Mold, Automotive, Heavy Equipment, Medical and General Engineering.

Throughout its 50 year history, Hanita has achieved a reputation for high quality, consistency, reliability and innovation, providing to its customers a constant flow of new and unique products and services, especially designed for maximum efficiency and performance in particular applications. Hanita has enabled its customers to become more competitive and more profitable in their own fields, producing parts in less time, with fewer tool changes and longer tool life.

Recognizing the unique needs of every customer, Hanita is also



known for its creative versatility in developing custom-tailored specialty tools. Offering application and design services and quick delivery specials capabilities, Hanita offers the advantages of state-of-the-art, high performance and high speed manufacturing processes that give their customers the winning edge.

Hanita is a wholly owned company of Kennametal, Inc., a NYSE corporation, and one of the world's largest companies in its field. Hanita fully utilizes Kennametal's global resources to assure a leading edge in research and product development, manufacturing engineering and quality control. Under the continuous supervision of the Israel Standards Institute, Hanita is ISO 9001, ISO 14001, and OHSAS 18001 certified.

Hanita Metal Works Ltd. is committed to providing its customers with tools and services that meet the highest industry standards, the most demanding machining objectives and the ultimate in customer satisfaction.



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# HANITA METAL WORKS LTD.



## PRODUCT SELECTION

pg 5-12

“What is the optimal tool?”, a concise and structured guide to find the optimal tool for the right application, all tools, all diameter ranges.



## CARBIDE ROUGHERS & SEMI FINISHERS

pg 13-22

The widest line of Carbide Roughers and Carbide Semi Finishers available for all materials and applications, including different pitch and profiles specifically designed to remove High Volumes with low Power consumption at High speeds with Extreme Long Life.



## HSSE/HSS PM ROUGHERS & SEMI FINISHERS

pg 23-36

High Performance and General Purpose HSSE (M-42) and HSS PM (Premium Powder Metal) Roughers and Semi Finishers, High Toughness Tools including different pitch and profiles specifically designed to Remove High Volumes with low Power consumption and Long Life.



## VARIMILL

pg 37-42

The Revolutionary Resonance Avoiding Line of Tools, CARBIDE and HSS PM. This extended line of products is the Chosen Solution to Machine Stainless Steels, Titanium, Inconel and Low Carbon Steels.



## VISION PLUS

pg 43-58

Large Range of Tools Specifically designed for Mold and Die and Ultra Hard Steels Machining, and get High Accuracy, Very straight walls and very long life at High Speed machining conditions, made from Premium Carbide and Coated TiAlN.



↓  
**CARBIDE FINISHERS**

pg 59–84

High Performance and General Purpose Carbide End Mills, made from High Quality Carbide.

↓  
**HSSE/HSS PM FINISHERS**

pg 85–100

High Performance and General Purpose High speed steels, made from Premium M-42 (HSSE) and HSS PM (Premium Powder Metal).

↓  
**CARBIDE DRILLS**

pg 101–120

High Performance and General Purpose Carbide Straight Point, easily regrindable Drills, made from High Quality Carbide.

↓  
**SPECIALS**

pg 121–126

Explanation on the Hanita Expertise for Special tools, including request for quotation forms.

↓  
**INFO**

pg 127-128

General Information.



# HANITA METAL WORKS LTD.

Type of tool	List no.	Shape	Range of size (mm) QMin-QMax	Coating	Tool Material	Length of cut (D: Diameter)			
						1xD	2xD	3xD	4xD
<b>Carbide Roughers &amp; Semi Finishers</b>									
	4909		6 ~ 25	••, WW	Carbide	←-----→			
	4979		6 ~ 25	••, CT	Carbide	←-----→			
	49N9		6 ~ 20	••	Carbide	←-----→			
	49G9		8 ~ 25	CT, CW	Carbide	←-----→			
	DQ13		3 ~ 20	LW	Carbide	←-----→			
	4966		5 ~ 25	CW, RW, LW	Carbide	←-----→			
	4906		4 ~ 25	TW, ZW, CW, RW, LW, RT	Carbide	←-----→			
	4976		4 ~ 25	MT	Carbide	←-----→			
	4940		6 ~ 25	LT	Carbide	←-----→			
	4970		6 ~ 25	CT, LT, LW	Carbide	←-----→			
	49H6		8 ~ 20	RW, LW	Carbide	←-----→			
<b>HSSE / HSS - PM Roughers &amp; Semi Finishers</b>									
	6609/19		6 ~ 32	WW	HSSE	←-----→			
	6676		10 ~ 32	WW, CW, LW	HSSE	←-----→			
	6667JJ		8 ~ 40	JJ, CJ, LJ	HSSE	←-----→			
	6604		6 ~ 25	WW, TW, ZW, CW, LW	HSSE	←-----→			
	6605/6/15/16		4 ~ 40	WW, FF, TW, ZW, CW, LW	HSSE	←-----→			
	6607/8/17/18		5 ~ 40	WW, FF, TW, CW, LW	HSSE	←-----→			
	6637JJ/38JJ		20 ~ 40	JJ	HSSE	←-----→			
	6645		4 ~ 30	WW, CW, LW	HSSE	←-----→			
	6673		10 ~ 32	WW, LW	HSSE	←-----→			
	6674		10 ~ 32	TW, CW, LW	HSSE	←-----→			
	6675		10 ~ 25	CW, LW	HSSE	←-----→			
	6N04		6 ~ 25	CW, LW	HSS-PM	←-----→			
	6N06		6 ~ 30	WW, CW, LW	HSS-PM	←-----→			
	6N70		6 ~ 32	LW, LT	HSS-PM	←-----→			
	6NL6		10 ~ 25	LW	HSS-PM	←-----→			

**Uncoated** \*\* WW, AA, FF, JJ

**TiN** TT, TW, TA, TE, TJ, TN

**Z-Coat** ZT, ZW

**TiCN** CT, CW, CA, CF, CJ

**TiAlN** LT, RT, LW, RW, LJ, RJ, RN



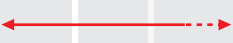





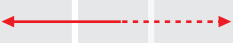


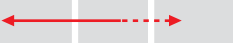


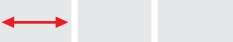



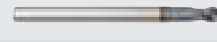

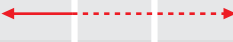


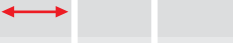


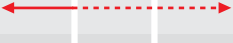
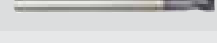

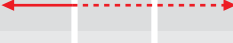
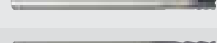

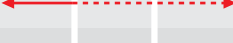
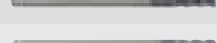


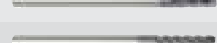


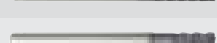













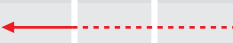






**AlTiN** MT

Application Features	Suitable to Machine										See Page	Recommended Working Details Page
	General Purpose	30 HRC or Less	40 HRC or Less Cast Iron	55 HRC or Less	55 HRC to 68 HRC	Stainless steels	Titanium	High temperature Alloys	Aluminium & Non Ferrous	Graphite		
Roughing Operation on Aluminium		✓✓							✓✓✓		15	21
Roughing and Semi-Finishing Aluminium Alloys		✓							✓✓✓		15	21
Deep Roughing and Semi-Finishing Aluminium		✓✓							✓✓✓		16	21
Roughing and Semi-Finishing Aluminium Alloys		✓							✓✓✓		16	21
Roughing and Semi-Finishing Stainless Steels	✓✓✓					✓✓✓					17	21
3D Roughing Operation	✓✓✓										17	21
General Purpose Roughing Operation	✓✓✓	✓✓✓	✓✓✓			✓					18	22
High Performance Roughing Operation		✓✓✓	✓✓✓	✓		✓✓	✓	✓✓			18	22
Roughing High Tensile Strength Steels And Titanium			✓✓✓	✓✓✓	✓	✓	✓✓✓	✓✓			19	22
Roughing High Tensile Strength Steels And Titanium			✓✓✓	✓✓✓	✓	✓✓	✓✓✓	✓✓			19	22
General Purpose Deep Roughing Operation		✓✓✓	✓✓✓			✓✓					20	22

Roughing Operation on Aluminium		✓✓							✓✓✓		25	34
Milling Aluminium Alloys		✓							✓✓✓		25	-
General Purpose 3D Roughing Operation	✓✓✓										26	-
General Purpose Roughing Operation		✓✓✓	✓✓			✓✓	✓				26	34
General Purpose Roughing Operation	✓✓✓										27	34
General Purpose Roughing Operation	✓✓✓										28	35
General Purpose Roughing Operation	✓✓✓										29	-
General Purpose, Pocketing and Roughing Operations	✓✓✓					✓✓✓					29	35
Milling Titanium Alloys		✓				✓✓					30	-
Milling Medium Tensile Strength Steels		✓✓✓				✓					30	-
Milling Medium Stainless Steel, Nickel and Cobalt Base Alloys		✓✓				✓✓✓					31	-
General Purpose Roughing Operation		✓✓✓	✓✓✓			✓✓	✓	✓			31	35
General Purpose Roughing Operation		✓✓✓	✓✓			✓✓✓	✓✓	✓			32	35
High Performance Semi-Roughing Operation		✓✓✓	✓✓✓			✓✓✓	✓✓✓	✓✓✓			32	36
General Purpose Deep Roughing Operation, Long Reach		✓✓✓	✓✓✓			✓✓✓	✓✓	✓			33	36

✓ GOOD    ✓✓ VERY GOOD    ✓✓✓ EXCELLENT

# HANITA METAL WORKS LTD.

Type of tool	List no.	Shape	Range of size (mm) QMin-QMax	Coating	Tool Material	Length of cut (D: Diameter)			
						1xD	2xD	3xD	4xD
<b>VariMill</b>									
	47N0		5 ~ 20	LT	Premium Carbide				
	4777		4 ~ 25	LT	Premium Carbide				
	4778		4 ~ 25	MT	Premium Carbide				
	1N77		6 ~ 30	CT, CW	HSS PM				
<b>Vision Plus</b>									
	7151		1 ~ 20	RT	Premium Carbide				
	7061		1 ~ 12	RT	Premium Carbide				
	70N1		1 ~ 12	RT	Premium Carbide				
	7150		2 ~ 20	RT	Premium Carbide				
	7050/60		2 ~ 20	RT	Premium Carbide				
	75N2		3 ~ 12	RT	Premium Carbide				
	75N8		6 ~ 12	RT	Premium Carbide				
	7585/95		3 ~ 25	LT	Premium Carbide				
	7505/45		3 ~ 25	LT	Premium Carbide				
	7515/25		6 ~ 25	LT	Premium Carbide				
	75N5		3 ~ 25	LT	Premium Carbide				
	7670		4 ~ 25	LT	Premium Carbide				
	7N01		0.3 ~ 6	RJ	Premium Carbide				
	7N02		0.3 ~ 2.5	RJ	Premium Carbide				
	7N12		0.5 ~ 2.5	RJ	Premium Carbide				
	7N22		0.4 ~ 3	RJ	Premium Carbide				

**Uncoated** \*\* WW, AA, FE, JJ

**TiN** TT, TW, TA, TE, TJ, TN

**Z-Coat** ZT, ZW

**TiCN** CT, CW, CA, CF, CJ

**TiAlN** LT, RT, LW, RW, LJ, RJ, RN

**AlTiN** MT

Application Features	Suitable to Machine										See Page	Recommended Working Details Page
	General Purpose	30 HRc or Less	40 HRc or Less Cast Iron	55 HRc or Less	55 HRc to 68 HRc	Stainless steels	Titanium	High temperature Alloys	Aluminium & Non Ferrous	Graphite		
Slotting and Finishing various Materials.		✓✓	✓✓			✓✓	✓✓	✓			39	41
Slotting and Finishing various Materials.		✓✓	✓✓			✓✓	✓✓	✓			39	41
Slotting and Finishing various Materials.		✓✓	✓✓			✓✓	✓✓	✓			40	41
Slotting and Finishing various Materials.		✓✓	✓✓			✓✓	✓✓	✓✓			40	42
Finishing in 3D Milling			✓✓	✓✓	✓✓						45	56
Deep 3D milling operation Additional strength due to the taper angle			✓✓	✓✓	✓✓						45	56
Deep 3D milling operation		✓	✓✓	✓✓	✓✓			✓			46	56
finishing in 3D milling			✓✓	✓✓	✓✓						46	56
Deep 3D milling operation			✓✓	✓✓	✓✓						47	56
Deep slotting and finishing operations		✓	✓✓	✓✓	✓	✓	✓		✓		48	56
Peripheral high finishing accuracy operation			✓✓	✓✓	✓✓						48	57
Deep Slotting and Peripheral Milling of Hard Steels			✓✓	✓✓	✓✓						49	57
Deep Slotting and Peripheral Milling of Hard Steels			✓✓	✓✓	✓✓						50	57
Shallow Slotting and Peripheral Milling of Hard Steels			✓✓	✓✓	✓✓						50	57
Deep Slotting and Peripheral Milling of Hard Steels, Long Reach			✓✓	✓✓	✓✓						51	57
Roughing in 3D Milling			✓✓	✓✓	✓✓	✓	✓✓				52	58
Milling on precision machining centers		✓✓	✓✓	✓✓	✓✓	✓	✓	✓	✓	✓✓	52	58
Milling on precision machining centers		✓✓	✓✓	✓✓	✓✓	✓	✓	✓	✓	✓✓	53	58
Milling on precision machining centers		✓✓	✓✓	✓✓	✓✓	✓	✓	✓	✓	✓✓	53	58
Rib processing and very fine operations		✓✓	✓✓	✓✓	✓✓	✓	✓	✓	✓	✓✓	54-55	58

✓ GOOD    ✓✓ VERY GOOD    ✓✓✓ EXCELLENT

# HANITA METAL WORKS LTD.

Type of tool	List no.	Shape	Range of size (mm) ΦMin-ΦMax	Coating	Tool Material	Length of cut (D: Diameter)			
						1xD	2xD	3xD	4xD
	4001/11/21		1 ~ 20	••, TT, CT, RT	Carbide	←-----→			
	4001JJ		1 ~ 20	JJ, RJ	Carbide	←-----→			
	4651		1 ~ 2	••, CT, RT	Carbide	←-----→			
	4000/10		3 ~ 20	••, TT, CT, RT	Carbide	←-----→			
	4002/12/22		1 ~ 25	••, TT, ZT, CT, RT	Carbide	←-----→			
	4102		1.5 ~ 20	••, CT, RT	Carbide	←-----→			
	4632		0.4 ~ 1.5	••, CT, RT	Carbide	←-----→			
	4003/13		1 ~ 25	••, TT, ZT, CT, RT	Carbide	←-----→			
	4103		3 ~ 20	••, CT	Carbide	←-----→			
	4503JJ		1 ~ 20	JJ, CJ, RJ	Carbide	←-----→			
	4603		3 ~ 20	••, RT	Carbide	←-----→			
	4633		0.4 ~ 1.8	••, CT, RT	Carbide	←-----→			
	4004/14/24		1 ~ 25	••, TT, ZT, CT, RT	Carbide	←-----→			
	D001/11		3 ~ 20	WW, CW, RW	Carbide	←-----→			
	D501		2 ~ 20	••, RT	Carbide	←-----→			
	D009		3 ~ 20	RW	Carbide	←-----→			
	DC19		3 ~ 20	LW	Carbide	←-----→			
	D000/10		3 ~ 20	WW, CW, RW	Carbide	←-----→			
	D002/12		2 ~ 20	WW, CW, RW	Carbide	←-----→			
	D502		3 ~ 20	••, RT	Carbide	←-----→			
	D003/13		2 ~ 20	WW, CW, RW	Carbide	←-----→			
	D503/13		2 ~ 20	WW, CW, RW	Carbide	←-----→			
	DC03		3 ~ 20	WW, LW	Carbide	←-----→			
	D004/14		2 ~ 20	WW, CW, RW	Carbide	←-----→			
	D507/17		6 ~ 20	WW, CW, RW	Carbide	←-----→			
	D518		4 ~ 25	RW, CW, RT	Carbide	←-----→			
	D618		3 ~ 20	RJ	Premium Carbide	←-----→			

Uncoated \*\* WW, AA, FF, JJ

TiN TT, TW, TA, TE, TJ, TN

Z-Coat ZT, ZW

TiCN CT, CW, CA, CF, CJ

TiAlN LT, RT, LW, RW, LJ, RJ, RN

AlTiN MT

	Application Features	Suitable to Machine										See Page	Recommended Working Details Page
		General Purpose	30 HRc or Less	40 HRc or Less Cast Iron	55 HRc or Less	55 HRc to 68 HRc	Stainless steels	Titanium	High temperature Alloys	Aluminium & Non Ferrous	Graphite		
3D Milling and Deep Slotting	✓✓✓	✓✓✓	✓✓✓							✓✓✓	61	79	
Deep 3D Milling	✓✓✓	✓✓✓	✓✓✓							✓✓✓	61	79	
3D Milling	✓✓✓	✓✓✓	✓✓✓							✓	62	-	
3D Milling	✓✓✓	✓✓✓	✓✓✓								62	79	
Slotting	✓✓✓	✓✓✓	✓✓✓							✓✓	63	79	
Slotting Aluminium										✓✓✓	64	80	
Slotting and Side Milling	✓✓✓	✓✓✓	✓✓✓							✓✓	64	-	
Slotting and Side Milling	✓✓✓	✓✓✓	✓✓✓								65	80	
Slotting and side milling Aluminium										✓✓✓	66	80	
Deep Slotting and Peripheral Finishing Operation		✓✓✓	✓✓✓	✓		✓✓✓	✓✓		✓✓✓		66	80	
Peripheral Finishing Operation		✓	✓✓			✓✓	✓		✓		67	-	
Slotting and Side Milling	✓✓✓	✓✓✓	✓✓✓							✓	67	-	
Peripheral Finishing Operation	✓✓✓	✓✓✓	✓✓✓								68	81	
3D Milling	✓✓✓	✓✓✓	✓✓✓							✓✓	69	81	
3D Milling at High Speed Machining		✓✓✓	✓✓							✓✓✓	69	81	
Deep 3D Milling	✓✓✓	✓✓✓				✓✓				✓	70	-	
3D Milling		✓✓✓	✓			✓✓✓	✓✓✓	✓	✓✓✓	✓✓✓	70	81	
3D Milling	✓✓✓	✓✓✓	✓✓✓								71	82	
Deep Slotting	✓✓✓	✓✓✓	✓✓✓							✓✓✓	72	82	
Slotting and Side Milling at High Speed Machining		✓✓✓								✓✓✓	73	82	
Slotting and Side Milling	✓✓✓	✓✓✓	✓✓✓								74	82	
Deep Slotting and Peripheral Finishing Operations		✓✓✓	✓✓✓	✓		✓✓	✓✓	✓	✓✓		75	83	
Slotting and Finishing Stainless Steel and Aluminium		✓✓✓	✓✓✓			✓✓✓	✓✓		✓		75	83	
Peripheral Finishing Operation	✓✓✓	✓✓✓	✓✓✓							✓✓	76	83	
Peripheral Finishing Operation		✓✓✓	✓✓✓	✓✓		✓✓✓	✓✓✓	✓✓✓		✓	77	83	
Peripheral High Accuracy Finishing Operation		✓	✓✓✓	✓✓	✓		✓	✓✓✓		✓✓	77	84	
Peripheral High Accuracy Long Milling of Ultra-Hard Steels				✓✓✓	✓✓✓						78	84	

✓ GOOD    ✓✓ VERY GOOD    ✓✓✓ EXCELLENT

# HANITA METAL WORKS LTD.

Type of tool	List no.	Shape	Range of size (mm) QMin-QMax	Coating	Tool Material	Length of cut (D: Diameter)			
						1xD	2xD	3xD	4xD
	1601		3 ~ 25	WW, FF, TW, CW, LW	HSSE	←-----→			
	1601JJ		3 ~ 25	JJ, TJ, CJ	HSSE	←-----→			
	1602/12		2 ~ 32	WW, FF, TW, ZW, CW, CF, LW	HSSE	←-----→			
	1N02		3 ~ 20	WW, CW, LW	HSSE-PM	←-----→			
	3502		9 ~ 25	WW, CW	HSSE	←-----→			
	1652JJ/62JJ		2 ~ 50	JJ, TJ, CJ	HSSE	←-----→			
	1603		3 ~ 25	WW, FF, TW, ZW, CW, LW	HSSE	←-----→			
	3603AA/13AA		1/5 ~ 10	AA, TA, CA	HSSE	←-----→			
	1605/15		2 ~ 20	WW, FF, TW, ZW, CW, LW	HSSE	←-----→			
	1634JJ		3 ~ 32	JJ, CJ, LJ	HSSE	←-----→			
	1625		6 ~ 25	WW	HSSE	←-----→			
	1N0M		3 ~ 25	LW	HSSE-PM	←-----→			
	1N0M/JJ		3 ~ 25	LJ	HSSE-PM	←-----→			
	1606/16		21 ~ 34	WW, FF, TW, CW, LW	HSSE	←-----→			
	1600		3 ~ 25	WW, TW, ZW, CW, LW	HSSE	←-----→			
	1N05/7		6 ~ 25	WW, CW, LW	HSSE-PM	←-----→			
	3605/15		3 ~ 30	••, WW, CW, CT, LW	HSSE	←-----→			
	3N05		6 ~ 25	WW, CW, LW	HSSE-PM	←-----→			
	5870		8 ~ 48	••, WW	HSSE				

## Carbide Drills

	M112		1 ~ 20	••, TT, RT	Carbide	←-----→			
	M132		0.5 ~ 20	••, TT, RT	Carbide	←-----→			
	M133		3 ~ 20	••, RT	Carbide	←-----→			
	M152		3 ~ 20	TN, RN, RT	Carbide	←-----→			
	M155		3 ~ 20	RT	Premium Carbide	←-----→			
	M162		3 ~ 20	TN, RN, RT	Carbide	←-----→			
	M252		3 ~ 20	RN, RT	Carbide	←-----→			
	M262		3 ~ 20	RN, RT	Carbide	←-----→			

Uncoated \*\* WW, AA, FF, JJ

TiN TT, TW, TA, TF, TJ, TN

Z-Coat ZT, ZW

TiCN CT, CW, CA, CF, CJ

TiAlN LT, RT, LW, RW, LJ, RJ, RN

AlTiN MT

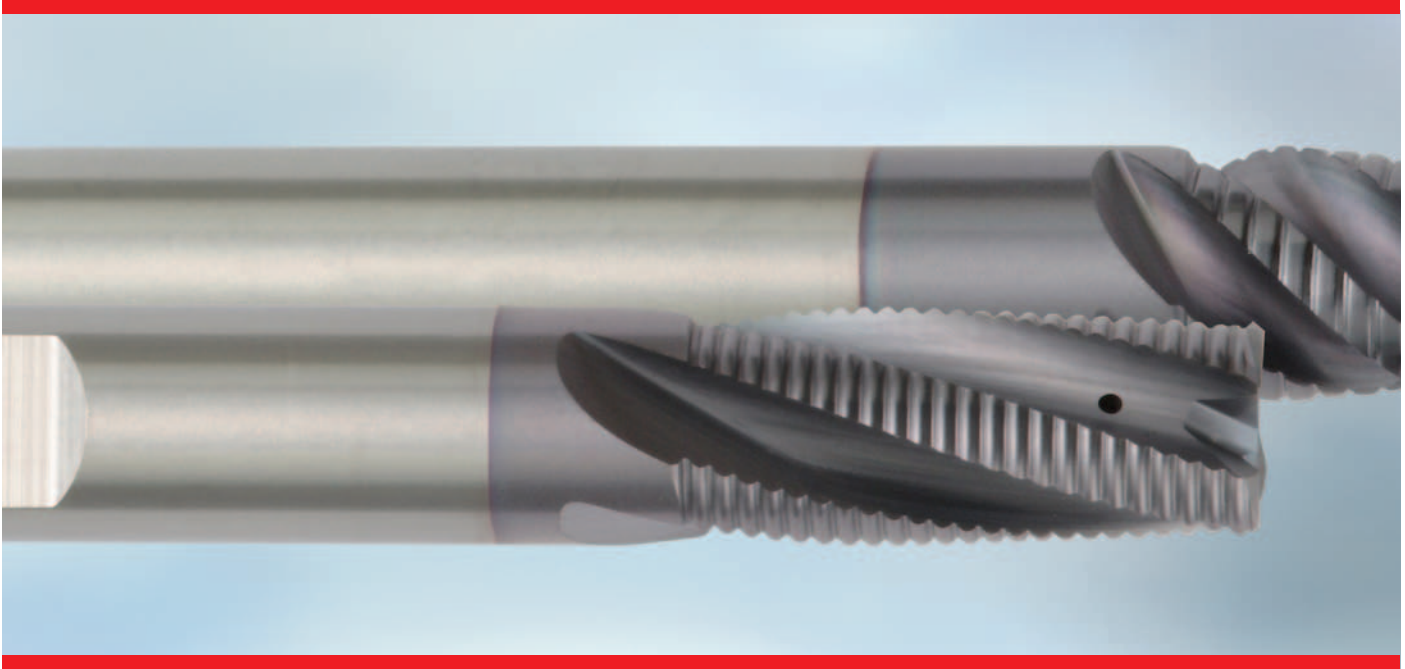
Application Features	Suitable to Machine										See Page	Recommended Working Details Page
	General Purpose	30 HRc or Less	40 HRc or Less Cast Iron	55 HRc or Less	55 HRc to 68 HRc	Stainless steels	Titanium	High temperature Alloys	Aluminium & Non Ferrous	Graphite		
3D Milling	✓✓✓										87	-
Deep 3D Milling	✓✓✓										87	-
General Purpose Slotting	✓✓✓										88	98
Slotting		✓✓✓	✓✓						✓✓		89	98
Roughing and Finishing Aluminium		✓✓									89	-
Deep Slotting	✓✓✓	✓✓✓							✓✓		90	-
Slotting and Side Milling	✓✓✓										91	-
Slotting and Side Milling - General Purpose	✓✓✓										91	-
Peripheral Finishing Operation	✓✓✓										92	98
Deep Peripheral Finishing Operation	✓✓✓										93	99
Deep Peripheral Finishing Operation	✓✓✓										93	99
High Performance Roughing and Finishing Operations		✓✓✓	✓✓			✓✓	✓✓✓	✓✓✓	✓✓✓		94	99
High Performance Roughing and Finishing Operations		✓✓✓	✓✓			✓✓	✓✓✓	✓✓✓	✓✓✓		94	-
Peripheral Finishing Operation	✓✓✓										95	-
3D Milling	✓✓✓										95	-
Peripheral Finishing Operation		✓✓✓	✓✓				✓✓	✓✓	✓✓		96	99
Slotting and Peripheral Finishing Operations		✓✓✓				✓	✓✓	✓✓✓			96	100
Slotting and Peripheral Finishing Operations		✓✓✓	✓✓			✓	✓✓	✓✓✓			97	100
Corner Radius Milling	✓✓✓										97	-

General Purpose Drilling	✓✓✓										103-104	119
General Purpose Drilling	✓✓✓										105-106	119
Shallow Depth Holes with Self Centering	✓✓✓										107-108	119
Drilling Depth of 3XD		✓	✓✓✓	✓✓	✓	✓	✓	✓			109-110	119
Drilling Depth of 3XD for Ultra Hard Steels				✓✓✓	✓✓✓						111-112	119
Drilling Depth of 5XD		✓	✓✓✓	✓✓✓	✓✓	✓	✓	✓			113-114	119
Drilling Depth of 3XD		✓	✓✓✓	✓✓✓	✓	✓✓	✓✓	✓✓			115-116	119
Drilling Depth of 5XD		✓	✓✓✓	✓✓✓	✓	✓✓	✓✓	✓✓			117-118	119

✓ GOOD   ✓✓ VERY GOOD   ✓✓✓ EXCELLENT

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## → CARBIDE ROUGHERS & SEMI FINISHERS |



With a focused objective of maximum metal removal capability for the particular workpiece material at hand, Hanita provides a wide range of unique sinusoidal profiles and chipbreaker forms required to attain that objective. Far more than just a given pitch, Hanita profile designs are uniquely formed and fine tuned to optimize chip form, size and speed of evacuation generated by a given material. Special proprietary carbide substrate materials and in-house true high quality coatings combine with these unique geometries to provide Hanita users a capability of significantly reducing machining time, with heavier and deeper cuts, fewer passes and much faster surface speed.

There are many applications when semi finished surface are acceptable on a part.

For these situations, Hanita offers a range of semi-finishing styles capable of producing extraordinary metal removal rates in a single pass, leaving this range of surface finish and thereby reducing machining time by hundreds of percents, with fewer tool changes and tool passes.

- Provides maximum metal removal rates in slotting and profiling operations.
- Available in:
  - 3, 4 & 5 flute styles
  - stub, regular and long lengths
  - TiN, TiCN and TiAlN Coatings
  - Solid and internal coolant hole styles
- Specific geometries targeted for, Aluminium, Steels, Stainless Steel, High Temperature Alloys, Titanium, Hardened and Ultra Hard Materials.



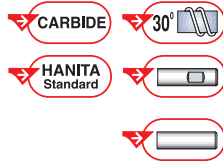
<b>Description</b>	<b>LIST</b>	<b>Page</b>
3 Flutes Square end Coarse Pitch	4909	15
3 Flutes Square end Corner Radii	4979	15
3 Flutes Square end Corner Radii and Neck	49N9	16
3 Flutes Square end with Internal Coolant	49G9	16
3 Flutes Square end Flat Profile Chip Breaker, Corner Radii	DQ13	17
Multi Flutes Ball Nose	4966	17
Multi Flutes Square end, Fine Pitch	4906	18
Multi Flutes Square end, Flat Shallow Pitch	4976	18
Multi Flutes Square end, Corner Radii	4940	19
Multi Flutes Square end	4970	19
Multi Flutes Square end, with Internal Coolant	49H6	20
Recommended Working Details		21-22



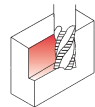
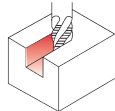
# ➔ CARBIDE ROUGHERS & SEMI FINISHERS |

## 3 FLUTES SQUARE END | COARSE PITCH LIST 4909

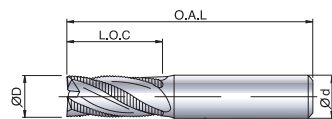
for Roughing Operation on Aluminium



Uncoated \*\*ww



D(d11)	d	L.O.C	O.A.L	Z	ITEM No.
6	6	13	57	3	490906002
8	8	16	63	3	490908003
10	10	22	72	3	490910004
12	12	26	83	3	490912005
14	14	26	83	3	490914014
16	16	32	92	3	490916006
18	18	32	92	3	490918018
20	20	38	104	3	490920007
25	25	45	121	3	490925008



NF

AI

AISI



## 3 FLUTES SQUARE END | CORNER RADII LIST 4979

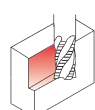
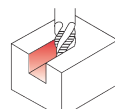
for Roughing and Semi-Finishing Aluminium Alloys



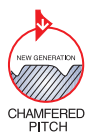
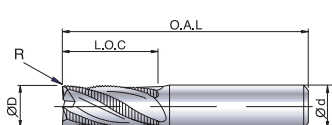
Corner Radius

Uncoated \*\*

TICN CT



D(d11)	d	L.O.C	O.A.L	R	Z	ITEM No.
6	6	13	57	0.25	3	497906002
8	8	16	63	0.25	3	497908003
10	10	22	72	0.50	3	497910004
12	12	26	83	0.50	3	497912005
16	16	32	92	1.0	3	497916006
20	20	38	104	1.0	3	497920007
25	25	45	121	1.5	3	497925008



NF

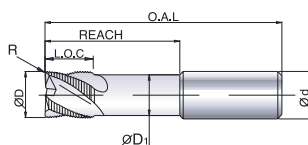
AI

AISI

for Deep Roughing and Semi-Finishing  
Aluminium

**3 FLUTES SQUARE END | CORNER RADII AND NECK  
LIST 49N9**

D(d11)	d	L.O.C	O.A.L	R	REACH	D <sub>1</sub>	Z	ITEM No.
6	6	8	57	0.25	18	5	3	<b>49N906002</b>
8	8	10	63	0.25	24	7	3	<b>49N908003</b>
10	10	12	72	0.50	30	9	3	<b>49N910004</b>
12	12	15	83	0.50	36	11	3	<b>49N912005</b>
16	16	20	92	1.0	48	15	3	<b>49N916006</b>
20	20	24	104	1.0	60	19	3	<b>49N920007</b>

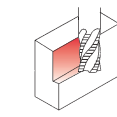
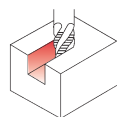


CARBIDE 40°

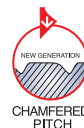
HANITA Standard

Corner Radius

Uncoated \*\*



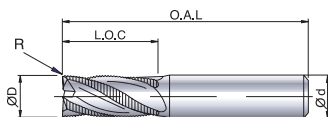
Al



for Roughing and Semi-Finishing Aluminium  
Alloys, Improving Chip Evacuation

**3 FLUTES SQUARE END | INTERNAL COOLANT  
LIST 49G9**

D(d11)	d	L.O.C	O.A.L	R	Z	ITEM No.
8	8	16	63	0.25	3	<b>49G908003</b>
10	10	22	72	0.50	3	<b>49G910004</b>
12	12	26	83	0.50	3	<b>49G912005</b>
16	16	32	92	1.0	3	<b>49G916006</b>
20	20	38	104	1.0	3	<b>49G920007</b>
25	25	45	121	1.5	3	<b>49G925008</b>

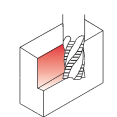
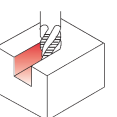


CARBIDE 40°

HANITA Standard

Corner Radius

TICN CT, CW



NF

Al

AlSi



# ➔ CARBIDE ROUGHERS & SEMI FINISHERS |

**3 FLUTES SQUARE END | FLAT PROFILE | CHIP BREAKER | CORNER RADII** for Roughing and Semi-Finishing Stainless Steels

## LIST DQ13

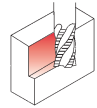
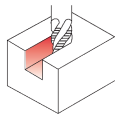


CARBIDE 35°

DIN 6527 Standard

Corner Radius

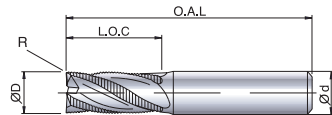
TiAlN LW



NEW GENERATION  
CHIP BREAKER  
PITCH

St S

D(d11)	d	L.O.C	O.A.L	R	Z	ITEM No.
3	6	7	54	0.25	3	DQ1303002
4	6	8	57	0.25	3	DQ1304002
5	6	10	57	0.25	3	DQ1305002
6	6	10	57	0.45	3	DQ1306002
7	8	13	63	0.45	3	DQ1307003
8	8	16	63	0.45	3	DQ1308003
10	10	19	72	0.45	3	DQ1310004
12	12	22	83	0.45	3	DQ1312005
14	14	22	83	0.45	3	DQ1314014
16	16	32	92	0.45	3	DQ1316006
18	18	32	92	0.45	3	DQ1318018
20	20	38	104	0.45	3	DQ1320007



## MULTI-FLUTES BALL NOSE LIST 4966

for 3D Roughing Operation

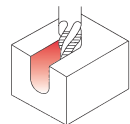


CARBIDE 20°

DIN 6527 Standard

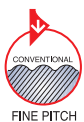
TiCN CW

TiAlN RW, LW



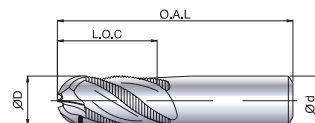
30-ST <45 HRC

30-ST HRC



CONVENTIONAL  
FINE PITCH

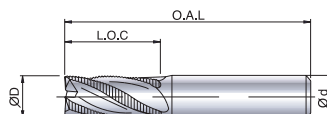
D(d11)	d	L.O.C	O.A.L	Z	ITEM No.
5	6	13	57	3	496605002
6	6	13	57	3	496606002
8	8	16	63	3	496608003
10	10	22	72	4	496610004
12	12	26	83	4	496612005
14	14	26	83	4	496614014
16	16	32	92	4	496616006
18	18	32	92	4	496618018
20	20	38	104	4	496620007
25	25	45	121	4	496625008



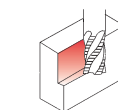
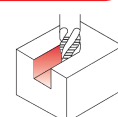
for General Purpose Roughing  
Operation

**MULTI-FLUTES SQUARE END | FINE PITCH  
LIST 4906**

D(d11)	d	L.O.C	O.A.L	Z	ITEM No.
4	6	11	55	3	490604002
5	6	13	57	3	490605002
6	6	13	57	3	490606002
7	8	16	63	3	490607003
8	8	16	63	3	490608003
9	10	19	72	4	490609004
10	10	22	72	4	490610004
11	12	26	83	4	490611005
12	12	26	83	4	490612005
13	14	26	83	4	490613014
14	14	26	83	4	490614014
16	16	32	92	4	490616006
18	18	32	92	4	490618018
20	20	38	104	4	490620007
25	25	45	121	5	490625008



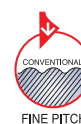
- CARBIDE
- 20°
- HANITA Standard
- TiN TW
- Z-Coat ZW
- TiCN CW
- TiAlN RW, LW, RT



30-ST <45 HRC

30-ST HRC

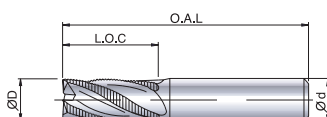
GENERAL PURPOSE



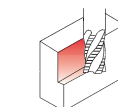
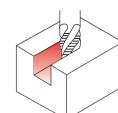
for High Performance Roughing Operation

**MULTI-FLUTES SQUARE END | FLAT SHALLOW PITCH  
LIST 4976**

D(d11)	d	L.O.C	O.A.L	Z	ITEM No.
4	6	8	57	3	497604002
5	6	13	57	3	497605002
6	6	13	57	3	497606002
8	8	16	63	3	497608003
10	10	22	72	4	497610004
12	12	26	83	4	497612005
14	14	26	83	4	497614014
16	16	32	92	4	497616006
18	18	32	92	4	497618018
20	20	38	104	4	497620007
25	25	45	121	5	497625008



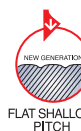
- CARBIDE
- 30°
- HANITA Standard
- AlTiN MT



30-ST <45 HRC

30-ST HRC

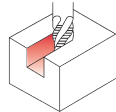
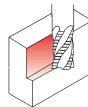
GENERAL PURPOSE



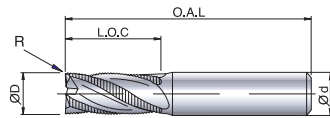
# ➔ CARBIDE ROUGHERS & SEMI FINISHERS |

## MULTI-FLUTES SQUARE END | CORNER RADII LIST 4940

for Roughing High Tensile Strength Steels  
And Titanium

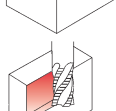
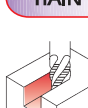
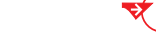


D(d11)	d	L.O.C	O.A.L	R	Z	ITEM No.
6	6	6	57	0.75	4	494006002
8	8	8	63	0.75	4	494008003
10	10	10	72	0.75	4	494010004
12	12	12	83	1.0	4	494012005
16	16	16	92	1.0	6	494016006
20	20	20	104	1.25	6	494020007
25	25	25	121	1.25	6	494025008

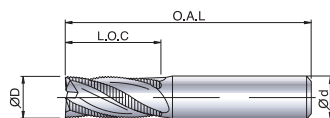


## MULTI-FLUTES SQUARE END LIST 4970

for Roughing High Tensile Strength Steels  
And Titanium



D(d11)	d	L.O.C	O.A.L	Z	ITEM No.
6	6	13	57	4	497006002
8	8	16	63	4	497008003
10	10	22	72	4	497010004
12	12	26	83	4	497012005
16	16	32	92	4	497016046
16	16	32	92	6	497016006
20	20	38	104	4	497020047
20	20	38	104	6	497020007
25	25	45	121	4	497025048
25	25	45	121	6	497025008

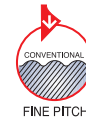
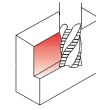
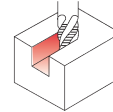
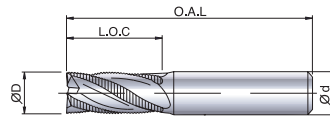


for General Purpose  
Deep Roughing Operation

**MULTI-FLUTES SQUARE END | INTERNAL COOLANT  
LIST 49H6**

**CARBIDE  
ROUGHERS &  
SEMI FINISHERS**

D(d11)	d	L.O.C	O.A.L	Z	ITEM No.
8	8	16	63	3	<b>49H608003</b>
10	10	22	72	4	<b>49H610004</b>
12	12	26	83	4	<b>49H612005</b>
14	14	26	83	4	<b>49H614014</b>
16	16	32	92	4	<b>49H616006</b>
18	18	32	92	4	<b>49H618018</b>
20	20	38	104	4	<b>49H620007</b>

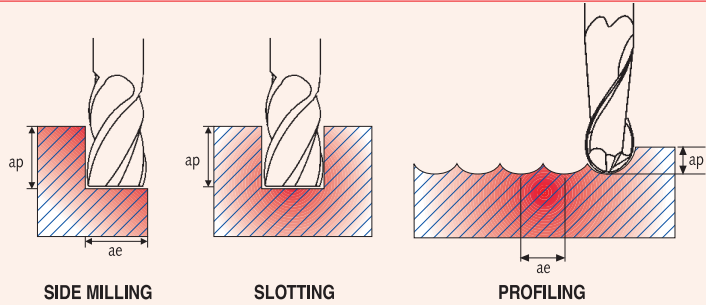


# ➔ CARBIDE ROUGHERS & SEMI FINISHERS |

## RECOMMENDED WORKING DETAILS

### FORMULAS

<b>Cutting Speed</b>	$V_c = \frac{D \times \pi \times n}{1000}$ (m/min)	<b>Formula Symbols:</b>	D (mm) Tool diameter
<b>Spindle Speed</b>	$n = \frac{V_c \times 1000}{\pi \times d}$ (1/min)		z No. of Flutes
<b>Feed per Tooth</b>	$f_z = \frac{V_f}{z \times n}$ (mm)		$V_c$ (m/min) Cutting Speed
<b>Table Feed</b>	$V_f = f_z \times z \times n$ (mm/min)		$F_z$ (mm) Feed per Tooth
			n (1/min) Spindle Speed
			$V_f$ (mm/min) Table Feed
			$\pi$ 3.1416



## LISTS 4909 / 4979 / 49G9 |

Material	Application			Vc-Cutting Speed m/min	f z- feed per tooth in mm D-Diameter in mm									
	Side Milling		Slotting		uncoated	6	8	10	12	14	16	18	20	25
	ap	ae	ap											
Aluminium alloys	1.5 x D	0.5 x D	1 x D	250-1000	0.054	0.069	0.085	0.100	0.115	0.131	0.146	0.162	0.200	
Aluminium High Silicon	1.5 x D	0.5 x D	1 x D	150-250	0.045	0.058	0.071	0.083	0.096	0.109	0.122	0.135	0.167	

For 4979 Uncoated Max Cutting Speed 2000 m/min  
 For 4979 Coated TiCN Max Cutting Speed 2500 m/min  
 For 49G9 Coated TiCN Max Cutting Speed 3000 m/min  
 For slotting : multiply by 0.8 the feed per tooth (f z) in the table.

## LIST 49N9 |

Material	Application			Vc-Cutting Speed m/min	fz- Feed Per Tooth in mm D- Diameter in mm						
	Side milling		Slotting		uncoated	6	8	10	12	16	20
	ap	ae	ap								
Aluminium Alloys	1xD	0.5xD	1xD	250-1000	0.071	0.120	0.150	0.170	0.200	0.220	

## LIST DQ13 |

Material	Rockwell Hardness	Type	Slotting	Vc-Cutting Speed m/min	f z- feed per tooth in mm D-Diameter in mm											
					TiAlN	3	4	5	6	7	8	10	12	14	16	18
				HRC	ap											
Steels	< 25		1 x D	150	0.015	0.020	0.025	0.030	0.033	0.036	0.041	0.061	0.061	0.061	0.064	0.066
Stainless Steels		AISI 302	1 x D	120	0.015	0.020	0.025	0.030	0.033	0.036	0.041	0.061	0.061	0.061	0.064	0.066
Stainless Steels		AISI 410	1 x D	100	0.010	0.015	0.020	0.025	0.028	0.030	0.036	0.051	0.053	0.056	0.058	0.061
Stainless Steels		AISI 316	1 x D	80	0.005	0.010	0.015	0.020	0.023	0.025	0.030	0.041	0.043	0.046	0.048	0.051
Inconel 718			1 x D	25	0.003	0.005	0.010	0.015	0.018	0.020	0.023	0.030	0.033	0.038	0.043	0.051
Aluminium			1 x D	500-1500	0.041	0.046	0.051	0.056	0.058	0.061	0.076	0.102	0.109	0.119	0.135	0.152

## LIST 4966 |

Material	Rockwell Hardness	Application			Vc-Cutting Speed		f z- feed per tooth in mm D-Diameter in mm									
		Side Milling		Slotting	m/min	m/min	TiCN	TiAlN	6	8	10	12	14	16	20	25
		ap	ae	ap												
Steels	< 22	1.5 x D	0.5 x D	0.75 x D	120	210	0.030	0.035	0.045	0.050	0.065	0.075	0.085	0.100		
Steels	22-32	1.5 x D	0.4 x D	0.75 x D	100	180	0.025	0.030	0.040	0.045	0.052	0.060	0.080	0.090		
Steels	32-40	1.5 x D	0.4 x D	0.6 x D	80	120	0.017	0.022	0.027	0.032	0.037	0.042	0.047	0.052		
Steels	40-45	1 x D	0.4 x D	0.5 x D	70	90	0.015	0.019	0.023	0.027	0.031	0.035	0.039	0.043		
Steels	45-50	1 x D	0.3 x D	0.4 x D		80	0.012	0.015	0.018	0.021	0.024	0.027	0.030	0.033		
Cast Iron		1.5 x D	0.5 x D	1 x D	150	180	0.030	0.036	0.048	0.054	0.062	0.072	0.096	0.120		

## RECOMMENDED WORKING DETAILS

### LIST 4906 |

Material	Rockwell Hardness	Application			Vc-Cutting Speed		f z- feed per tooth in mm D-Diameter in mm							
		Side Milling		Slotting	m/min	m/min	6	8	10	12	14	16	20	25
		ap	ae	ap	TiCN	TiAlN								
Steels	< 22	1.5 x D	0.5 x D	0.75 x D	120	210	0.030	0.035	0.045	0.050	0.065	0.075	0.085	0.100
Steels	22-32	1.5 x D	0.4 x D	0.75 x D	100	180	0.025	0.030	0.040	0.045	0.052	0.060	0.080	0.090
Steels	32-40	1.5 x D	0.4 x D	0.6 x D	80	120	0.017	0.022	0.027	0.032	0.037	0.042	0.047	0.052
Steels	40-45	1 x D	0.4 x D	0.5 x D	70	90	0.015	0.019	0.023	0.027	0.031	0.035	0.039	0.043
Steels	45-50	1 x D	0.3 x D	0.4 x D		80	0.012	0.015	0.018	0.021	0.024	0.027	0.030	0.033
Cast Iron		1.5 x D	0.5 x D	1 x D	150	180	0.030	0.036	0.048	0.054	0.062	0.072	0.096	0.120

### LIST 4976 |

Material	Application			VC-Cutting Speed m/min AITiN	fz-feed per tooth in mm D - diameter in mm							
	Side milling		Slotting		4	6	8	10	12	16	20	25
	ae	ap	ap									
steels<30HRc	0.5xD	1xD	1xD	160~200	0.025	0.030	0.035	0.045	0.050	0.055	0.080	0.100
30HRc~40HRc	0.3xD	1xD	1xD	120~160	0.020	0.025	0.030	0.040	0.045	0.060	0.066	0.070
40HRc~52HRc	0.25xD	1xD	0.5xD	70~120	0.015	0.020	0.025	0.030	0.040	0.045	0.050	0.055
EASY TO CUT STAINLESS STEELS	0.4xD	1xD	1xD	80~120	0.025	0.031	0.034	0.045	0.050	0.052	0.055	0.062
DIFFICULT TO CUT	0.3xD	1xD	0.5xD	60~80	0.015	0.020	0.030	0.040	0.045	0.050	0.052	0.060
STAINLESS STEELS GRAY CAST IRON	0.5xD	1xD	1xD	120~180	0.030	0.035	0.040	0.045	0.050	0.052	0.056	0.060
TITANIUM	0.3xD	1xD	0.5xD	40~60	0.015	0.020	0.025	0.040	0.050	0.055	0.057	0.060

### LISTS 4970 / 4940 |

Material	Rockwell Hardness	Application			Vc-Cutting Speed m/min	Vc-Cutting Speed m/min	f z- feed per tooth in mm D-Diameter in mm						
		Side Milling		Slotting			6	8	10	12	16	20	25
		ap	ae	ap									
Steels	35-45	1.5 x D	0.40 x D	0.50 x D	100	150	0.020	0.025	0.030	0.040	0.050	0.065	0.070
Steels	45-55	1.5 x D	0.33 x D	0.50 x D	73	110	0.015	0.020	0.025	0.030	0.040	0.050	0.055
Steels	55-60	1.5 x D	0.25 x D	0.30 x D	60	90	0.010	0.015	0.020	0.025	0.030	0.040	0.045
Titanium	< 40	1.5 x D	0.33 x D	0.50 x D	45	70	0.030	0.035	0.040	0.050	0.070	0.080	0.085
Titanium	> 40	1.5 x D	0.25 x D	0.30 x D	40	60	0.025	0.030	0.035	0.045	0.060	0.075	0.080
Inconel		1.0 x D	0.20 x D	0.25 x D	20	30	0.015	0.020	0.025	0.030	0.040	0.050	0.055

Feed per tooth (fz) in the table is for 4970, for 4940 multiply feed per tooth by 1.2.  
For slotting : Use 4 flute and multiply by 0.8 the feed per tooth (f z) in the table.

### LIST 49H6 |

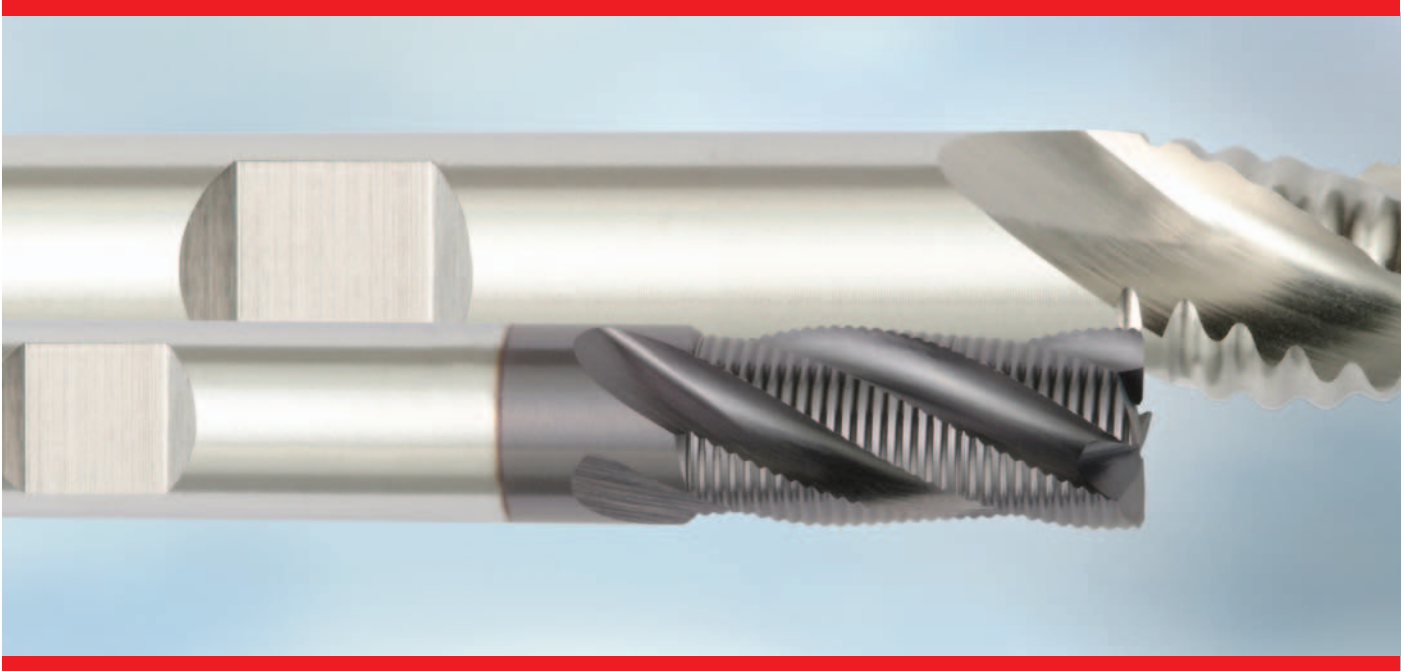
Material	Rockwell Hardness	Application			Vc-Cutting Speed		f z- feed per tooth in mm D-Diameter in mm							
		Side Milling		Slotting	m/min	m/min	6	8	10	12	14	16	20	25
		ap	ae	ap	TiCN	TiAlN								
Steels	< 22	1.5 x D	0.5 x D	0.75 x D	120	210	0.030	0.035	0.045	0.050	0.065	0.075	0.085	0.100
Steels	22-32	1.5 x D	0.4 x D	0.75 x D	100	180	0.025	0.030	0.040	0.045	0.052	0.060	0.080	0.090
Steels	32-40	1.5 x D	0.4 x D	0.6 x D	80	120	0.017	0.022	0.027	0.032	0.037	0.042	0.047	0.052
Steels	40-45	1 x D	0.4 x D	0.5 x D	70	90	0.015	0.019	0.023	0.027	0.031	0.035	0.039	0.043
Steels	45-50	1 x D	0.3 x D	0.4 x D		80	0.012	0.015	0.018	0.021	0.024	0.027	0.030	0.033
Cast Iron		1.5 x D	0.5 x D	1 x D	150	180	0.030	0.036	0.048	0.054	0.062	0.072	0.096	0.120

**NOTE**

Data shown is the result of actual machining tests and is suggested as a starting point.  
Do sensitivity analyses to achieve optimum results.  
The tests were run on an optimal machining environment.

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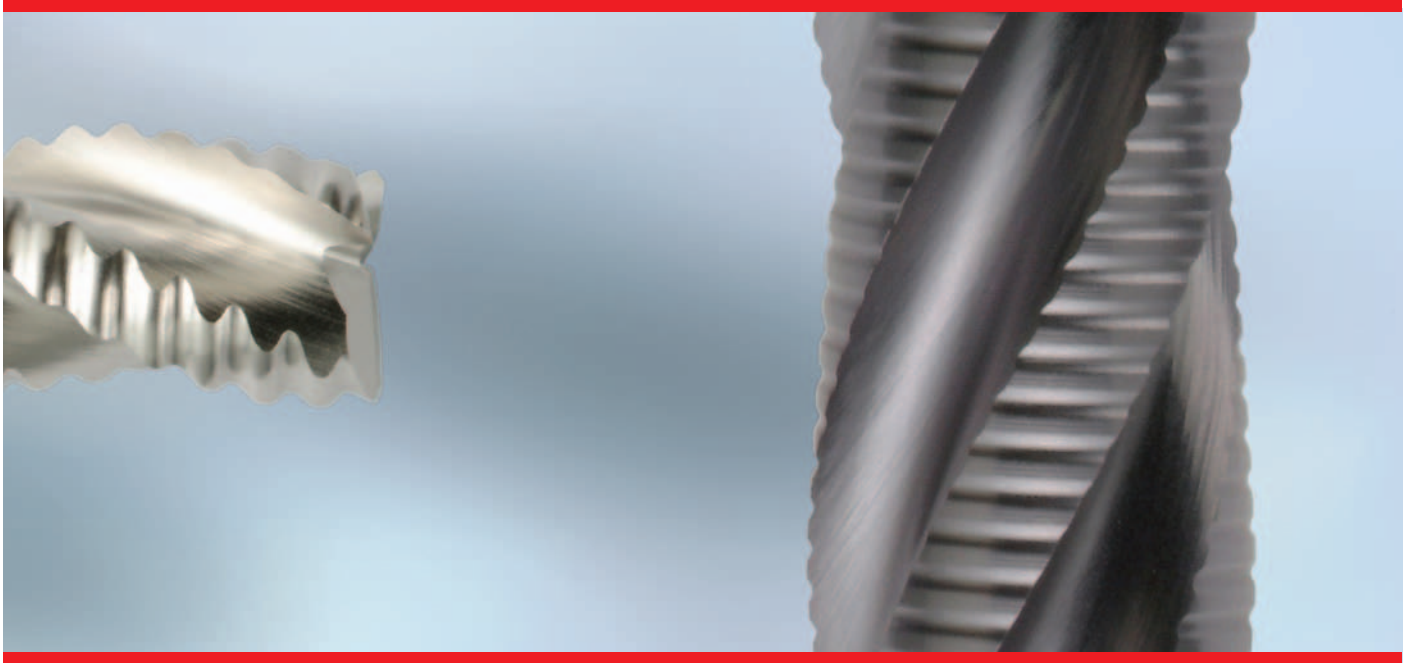
## → HSSE/HSS PM ROUGHERS & SEMI FINISHERS |



Known as the leader in the field of roughing end mills, Hanita delivers outstanding tools, achieving maximum metal removal rates while offering the widest variety of premium cobalt and powdered metal roughing tools available. The tools are designed with unique sinusoidal profiles and chipbreaker forms to optimize performance and are offered with high quality PVD coatings to enable the tools to run at high speeds and deliver longest tool life.

Hanita roughers enable the user to save considerable tool costs even over carbide tools. They can also help to avoid severe tool breakage because of their superior toughness. Often able to outperform even indexable style tools, with their capability of taking deeper and heavier cuts Hanita users can significantly reduce machining time and increase overall productivity.

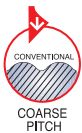
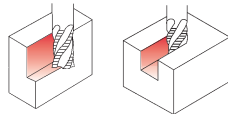
- Available in Coarse, Fine, Extra Fine and specially designed profiles for specific materials.
- Provides maximum metal removal rates in slotting and profiling operations.
- Specific geometries targeted for Aluminium, Steels, Stainless Steels, High Temperature Alloys and Titanium.



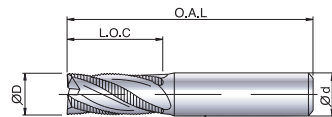
# ➔ HSSE/HSS PM ROUGHERS & SEMI FINISHERS |

## 3 FLUTES SQUARE END | COARSE PITCH LISTS 6609 / 6619 HSS Co

for Roughing Operation  
on Aluminium

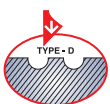
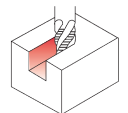
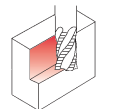


D	d	L.O.C	O.A.L	Z	ITEM No.
6	6	13	57	3	660906002
8	10	19	69	3	660908004
10	10	22	72	3	660910004
12	12	26	83	3	660912005
12	12	53	110	3	661912005
16	16	32	92	3	660916006
16	16	63	123	3	661916006
20	20	38	104	3	660920007
20	20	75	141	3	661920007
25	25	45	121	3	660925008
25	25	90	166	3	661925008
30	25	45	125	3	660930008
32	32	53	133	3	660932009
32	32	106	186	3	661932009

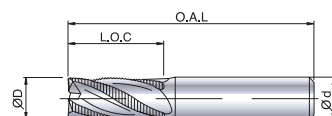


## 3 FLUTES SQUARE END | SEMI-FINISHER | FLAT PROFILE TYPE D LIST 6676 HSS Co

for Milling Aluminium Alloys



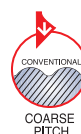
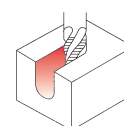
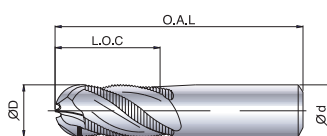
D	d	L.O.C	O.A.L	Z	ITEM No.
10	10	22	72	3	667610004
12	12	26	83	3	667612005
14	12	26	83	3	667614005
16	16	32	92	3	667616006
18	16	32	92	3	667618006
20	20	38	104	3	667620007
22	20	38	104	3	667622007
25	25	45	121	3	667625008
32	32	53	133	3	667632009



for General Purpose 3D  
Roughing Operation

### MULTI-FLUTES BALL NOSE | COARSE PITCH LIST 6667 JJ HSS Co

D	d	L.O.C	O.A.L	R	Z	ITEM No.
8	8	20	90	4	4	666708003
10	10	25	100	5	4	666710004
12	12	32	115	6	4	666712005
14	12	32	115	7	4	666714005
16	16	36	130	8	4	666716006
18	16	40	130	9	4	666718006
20	20	45	145	10	4	666720007
25	25	50	165	12.5	6	666725008
30	25	63	180	15	6	666730008
40	32	70	190	20	6	666740009

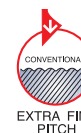
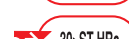
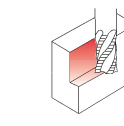
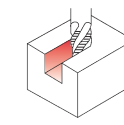
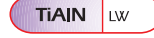
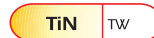
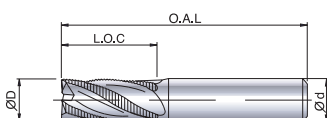


HSS/HSS PM  
ROUGHERS  
& SEMI  
FINISHERS

for General Purpose  
Roughing Operation

### MULTI-FLUTES SQUARE END | EXTRA FINE PITCH LIST 6604 HSS Co

D	d	L.O.C	O.A.L	Z	ITEM No.
6	6	13	57	3	660406002
8	10	19	69	3	660408004
10	10	22	72	4	660410004
12	12	26	83	4	660412005
14	12	26	83	4	660414005
16	16	32	92	4	660416006
18	16	32	92	4	660418006
20	20	38	104	4	660420007
22	20	38	104	5	660422007
25	25	45	121	5	660425008



# ➔ HSSE/HSS PM ROUGHERS & SEMI FINISHERS |

## MULTI-FLUTES SQUARE END | FINE PITCH LISTS 6605/6606/6615/6616 HSS Co

for General Purpose  
Roughing Operation



Uncoated WW, FF\*

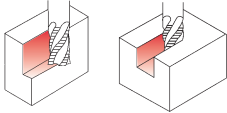
TiN TW

Z-Coat ZW

TiCN CW

TiAlN LW

\* only for lists 6605/6



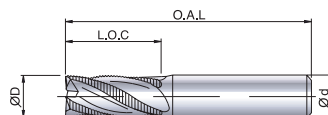
St S

30>ST HRc

GENERAL PURPOSE

D	d	L.O.C	O.A.L	Z	ITEM No.
4	6	11	55	3	660604002
5	6	13	57	3	660605002
6	6	13	57	3	660606002
6	6	24	68	3	661606002
7	10	16	66	3	660607004
8	10	19	69	3	660608004
8	10	38	88	3	661608004
9	10	19	69	3	660609004
10	10	22	72	4	660610004
10	10	45	95	4	661610004
11	12	22	79	4	660611005
12	12	26	83	4	660612005
12	12	53	110	4	661612005
13	12	26	83	4	660613005
14	12	26	83	4	660614005
14	12	53	110	4	661614005
15	12	26	83	4	660615005
16	16	32	92	4	660616006
16	16	63	123	4	661616006
17	16	32	92	4	660617006
18	16	32	92	4	660618006
18	16	63	123	4	661618006
19	16	32	92	4	660619006
20	16	38	98	4	660620006
20	20	38	104	4	660620007
20	16	75	135	4	661620006
20	20	75	141	4	661620007
22	20	38	104	5	660622007
22	20	75	141	5	661622007
24	25	45	121	5	660624008
25	25	45	121	5	660625008
25	25	90	166	5	661625008
28	25	45	121	6	* 660528008
28	25	90	166	6	* 661528008
30	25	45	121	6	* 660530008
30	25	90	166	6	* 661530008
32	32	53	133	6	* 660532009
32	32	100	170	6	* 661532009
35	32	53	133	6	* 660535009
36	32	53	133	6	* 660536009
36	32	100	170	6	* 661536009
40	40	63	155	6	* 660540001
40	32	63	143	6	* 660540009
40	40	125	217	6	* 661540001
40	32	100	170	6	* 661540009

\* CENTRE HOLE  
• NOT AVAILABLE WITH FF THREADED SHANK



for General Purpose  
Roughing Operation

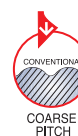
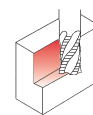
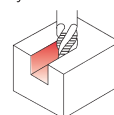
## MULTI-FLUTES SQUARE END | COARSE PITCH LISTS 6607/6608/6617/6618 HSS Co

D	d	L.O.C	O.A.L	Z	ITEM No.
5	6	13	57	3	660805002
6	6	13	57	3	660806002
6	6	24	68	3	661806002
7	10	16	66	3	660807004
8	10	19	69	3	660808004
8	10	38	88	3	661808004
9	10	19	69	3	660809004
10	10	22	72	4	660810004
10	10	45	95	4	661810004
11	12	22	79	4	660811005
12	12	26	83	4	660812005
12	12	53	110	4	661812005
13	12	26	83	4	660813005
14	12	26	83	4	660814005
14	12	53	110	4	661814005
15	12	26	83	4	660815005
16	16	32	92	4	660816006
16	16	63	123	4	661816006
18	16	32	92	4	660818006
18	16	63	123	4	661818006
20	16	38	98	4	660820006
20	20	38	104	4	660820007
20	16	75	135	4	661820006
20	20	75	141	4	661820007
22	20	38	104	5	660822007
22	25	85	150	5	661822008
24	25	45	121	5	660824008
25	25	45	121	5	660825008
25	25	90	166	5	661825008
28	25	45	121	6	* 660728008
28	25	90	166	6	* 661728008
30	25	45	121	6	* 660730008
30	25	90	166	6	* 661730008
32	32	53	133	6	* 660732009
32	32	100	170	6	* 661732009
35	32	53	133	6	* 660735009
36	32	53	133	6	* 660736009
36	32	100	170	6	* 661736009
40	32	63	143	6	* 660740009
40	40	125	217	6	* 661740001

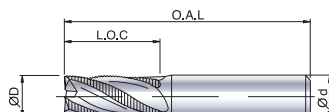
\* CENTRE HOLE  
• NOT AVAILABLE WITH FF THREADED SHANK



\* only for lists 6607/8



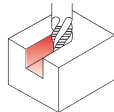
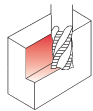
HSS/HSS PM  
ROUGHERS  
& SEMI  
FINISHERS



# ➔ HSSE/HSS PM ROUGHERS & SEMI FINISHERS |

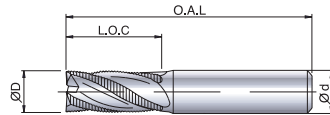
## MULTI-FLUTES SQUARE END | COARSE PITCH | EXTRA LONG TYPE LISTS 6637JJ / 6638JJ HSS Co

for General Purpose  
Roughing Operation



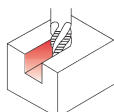
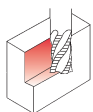
D	d	L.O.C	O.A.L	Z	ITEM No.
20	20	100	200	4	<b>663820007</b>
25	25	100	200	5	<b>663825008</b>
25	25	120	220	5	<b>663825018</b>
30	25	120	220	6	* <b>663730008</b>
30	25	150	250	6	* <b>663730018</b>
40	32	120	220	6	* <b>663740009</b>
40	32	150	250	6	* <b>663740019</b>

\* CENTRE HOLE

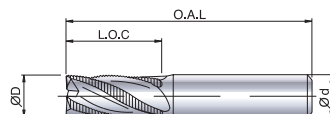


## MULTI-FLUTES SQUARE END | FINE PITCH | STUB LENGTH LIST 6645 HSS Co

for General Purpose, Pocketing  
and Roughing Operations



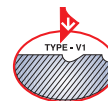
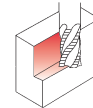
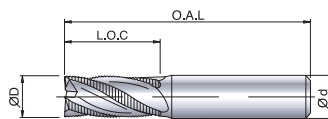
D	d	L.O.C	O.A.L	Z	ITEM No.
4	6	7	51	3	<b>664504002</b>
5	6	8	52	3	<b>664505002</b>
6	6	8	52	3	<b>664506002</b>
8	10	11	61	3	<b>664508004</b>
10	10	13	63	3	<b>664510004</b>
12	12	16	73	3	<b>664512005</b>
14	12	16	73	3	<b>664514005</b>
16	16	19	79	3	<b>664516006</b>
18	16	19	79	3	<b>664518006</b>
20	16	23	89	3	<b>664520006</b>
25	25	26	102	3	<b>664525008</b>
30	25	26	102	4	<b>664530008</b>



for Milling  
Titanium Alloys

**MULTI FLUTES SQUARE END | SEMI-FINISHER | FLAT PROFILE TYPE V1**  
**LIST 6673 HSS Co**

D	d	L.O.C	O.A.L	Z	ITEM No.
10	10	22	72	4	667310004
12	12	26	83	4	667312005
14	12	26	83	4	667314005
16	16	32	92	4	667316006
18	16	32	92	5	667318006
20	20	38	104	5	667320007
22	20	38	104	5	667322007
25	25	45	121	6	667325008
32	32	53	133	6	667332009

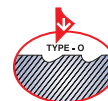
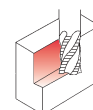
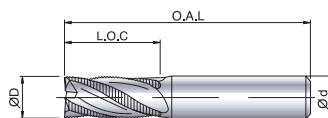


HSS/HSS PM  
ROUGHERS  
& SEMI  
FINISHERS

for Milling Medium  
Tensile Strength Steels

**MULTI-FLUTES SQUARE END | SEMI-FINISHER | FLAT PROFILE TYPE O**  
**LIST 6674 HSS Co**

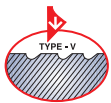
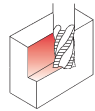
D	d	L.O.C	O.A.L	Z	ITEM No.
10	10	22	72	4	667410004
12	12	26	83	4	667412005
14	12	26	83	4	667414005
16	16	32	92	4	667416006
18	16	32	92	4	667418006
20	20	38	104	4	667420007
22	20	38	104	4	667422007
25	25	45	121	5	667425008
32	32	53	133	5	667432009



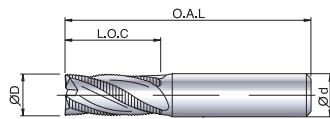
# ➔ HSSE/HSS PM ROUGHERS & SEMI FINISHERS |

**MULTI-FLUTES SQUARE END | SEMI-FINISHER |**  
**FLAT PROFILE TYPE V**  
**LIST 6675 HSS Co**

for Milling Medium  
 Stainless Steel, Nickel and Cobalt Base Alloys

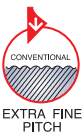
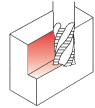
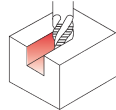


D	d	L.O.C	O.A.L	Z	ITEM No.
10	10	22	72	4	<b>667510004</b>
12	12	26	83	4	<b>667512005</b>
14	12	26	83	4	<b>667514005</b>
16	16	32	92	4	<b>667516006</b>
18	16	32	92	5	<b>667518006</b>
20	20	38	104	5	<b>667520007</b>
22	20	38	104	5	<b>667522007</b>
25	25	45	121	6	<b>667525008</b>

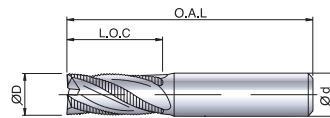


**MULTI-FLUTES SQUARE END | EXTRA FINE PITCH**  
**LIST 6N04 HSS PM**

for General Purpose  
 Roughing Operation



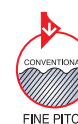
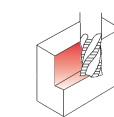
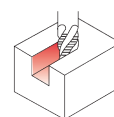
D	d	L.O.C	O.A.L	Z	ITEM No.
6	6	13	57	3	<b>6N0406002</b>
8	10	19	69	3	<b>6N0408004</b>
10	10	22	72	4	<b>6N0410004</b>
12	12	26	83	4	<b>6N0412005</b>
16	16	32	92	4	<b>6N0416006</b>
18	16	32	92	4	<b>6N0418006</b>
20	20	38	104	4	<b>6N0420007</b>
25	25	45	121	5	<b>6N0425008</b>



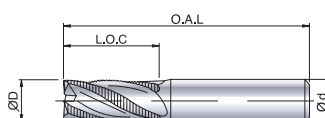
for General Purpose  
Roughing Operation

### MULTI-FLUTES SQUARE END | FINE PITCH LIST 6N06 HSS PM

D	d	L.O.C	O.A.L	Z	ITEM No.
6	6	13	57	4	6N0606002
7	10	16	66	4	6N0607004
8	10	19	69	4	6N0608004
9	10	19	69	4	6N0609004
10	10	22	72	4	6N0610004
11	12	22	79	4	6N0611005
12	12	26	83	4	6N0612005
13	12	26	83	4	6N0613005
14	12	26	83	4	6N0614005
15	12	26	83	4	6N0615005
16	16	32	92	4	6N0616006
18	16	32	92	4	6N0618006
20	20	38	104	4	6N0620007
22	20	38	104	5	6N0622007
25	25	45	121	5	6N0625008
30	25	45	121	6	6N0630008



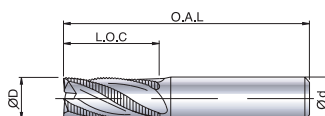
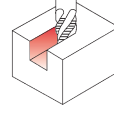
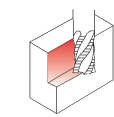
HSS/HSS PM  
ROUGHERS  
& SEMI  
FINISHERS



for High Performance  
Semi-Roughing Operation

### HIGH PERFORMANCE MULTI-FLUTES SQUARE END | SEMI-FINISHER LIST 6N70 HSS PM

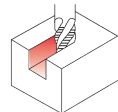
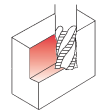
D	d	L.O.C	O.A.L	Z	ITEM No.
6	6	13	57	4	6N7006002
8	10	19	69	4	6N7008004
10	10	22	72	4	6N7010004
12	12	26	83	4	6N7012005
14	12	26	83	4	6N7014005
16	16	32	92	4	6N7016006
18	16	32	92	4	6N7018006
20	20	38	104	4	6N7020007
25	25	45	121	4	6N7025008
32	32	53	133	6	6N7032009



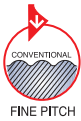
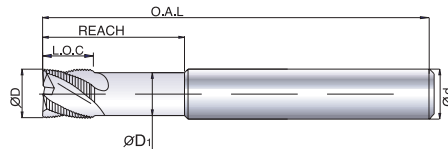
# ➔ HSSE/HSS PM ROUGHERS & SEMI FINISHERS |

**MULTI-FLUTES SQUARE END | FINE PITCH | WITH NECK**  
**LIST 6NL6 HSS PM**

for General Purpose Deep  
 Roughing Operation, Long Reach



D	d	L.O.C	O.A.L	REACH	Z	ITEM No.
10	10	22	110	69	4	<b>6NL610004</b>
12	12	26	125	78	4	<b>6NL612005</b>
16	16	32	138	87	4	<b>6NL616006</b>
20	20	38	160	108	4	<b>6NL620007</b>
25	25	45	216	155	5	<b>6NL625008</b>

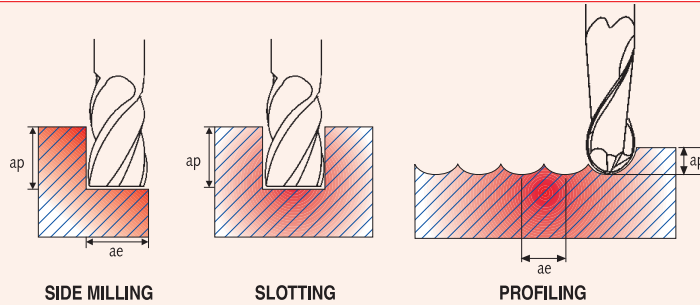


# ➔ HSSE/HSS PM ROUGHERS & SEMI FINISHERS |

## RECOMMENDED WORKING DETAILS

### FORMULAS

<b>Cutting Speed</b>	$V_c = \frac{D \times \pi \times n}{1000}$ (m/min)	<b>Formula Symbols:</b>
<b>Spindle Speed</b>	$n = \frac{V_c \times 1000}{\pi \times d}$ (1/min)	<b>D</b> (mm) Tool diameter
<b>Feed per Tooth</b>	$f_z = \frac{V_f}{z \times n}$ (mm)	<b>z</b> No. of Flutes
<b>Table Feed</b>	$V_f = f_z \times z \times n$ (mm/min)	<b>V<sub>c</sub></b> (m/min) Cutting Speed
		<b>F<sub>z</sub></b> (mm) Feed per Tooth
		<b>n</b> (1/min) Spindle Speed
		<b>V<sub>f</sub></b> (mm/min) Table Feed
		<b>π</b> 3.1416



HSSE/HSS PM  
ROUGHERS  
& SEMI  
FINISHERS

## LISTS 6609 / 6619 |

Material	Application			Vc-Cutting Speed		Fz=feed per tooth in mm D - diameter in mm						
	Side ap	Milling ae	slotting ap	Uncoated	TiCN	10	12	16	20	25	30	32
				m/min	m/min							
Aluminum Alloys	1.5xD	0.5xD	1xD	110	220	0.052	0.065	0.075	0.105	0.125	0.125	0.125
Aluminum High S ilicon	1.5xD	0.5xD	1xD	65	130	0.050	0.060	0.070	0.100	0.120	0.120	0.120

## LIST 6604 |

Material	Rockwell Hardness HRc	Application			Vc-Cutting Speed			fz-feed per tooth in mm D - diameter in mm									
		Side Milling		Slotting	m/min	m/min	m/min	6	8	10	12	16	20	25	28	30	36
		ap	ae	ap	Uncoated	TiCN	TiAlN										
Steels	<20	1.5xD	0.5xD	1xD	30	70	80	0.014	0.024	0.044	0.056	0.067	0.085	0.100	0.110	0.120	0.120
Steels	20-32	1.5xD	0.5xD	1xD	25	55	60	0.012	0.022	0.032	0.048	0.060	0.081	0.085	0.088	0.100	0.100
Steels	32-42	1.5xD	0.5xD	1xD	15	40	45	0.012	0.020	0.029	0.043	0.054	0.073	0.087	0.077	0.077	0.097
Cast Iron <180 HB		1.5xD	0.5xD	1xD	25	55	60	0.012	0.022	0.032	0.048	0.060	0.081	0.085	0.088	0.100	0.100
Cast Iron >180 HB		1.5xD	0.5xD	1xD	15	40	45	0.012	0.020	0.029	0.043	0.054	0.073	0.087	0.077	0.077	0.097
Stainless Steels		1.5xD	0.5xD	1xD	12	30	35	0.011	0.019	0.027	0.041	0.050	0.070	0.073	0.073	0.079	0.092
Titanium		1.5xD	0.5xD	0.5xD	10	25	30	0.011	0.019	0.027	0.041	0.050	0.070	0.073	0.073	0.079	0.092
High Temperature Alloys		1.5xD	0.5xD	0.25xD	6	9	12	0.012	0.020	0.029	0.043	0.054	0.073	0.087	0.077	0.077	0.097

For slotting: multiply by 0.6 the feed per tooth (fz) in the table.

## LISTS 6605 / 6606 / 6615 / 6616 |

Material	Rockwell Hardness HRc	Application			Vc-Cutting Speed		Vc-Cutting Speed		fz-feed per tooth in mm D-Diameter in mm										
		Side Milling		Slotting	m/min	m/min	m/min	m/min	6	7	8	9	10	11	12	13	14	16	18
		ap	ae	ap	uncoated	TiN	TiCN	TiAlN											
Steels		1.5 x D	0.5 x D	1 x D	30	45	70	90	0.015	0.020	0.024	0.030	0.036	0.048	0.054	0.056	0.060	0.066	0.078
Steels	20-30	1.5 x D	0.5 x D	1 x D	25	35	40	75	0.012	0.018	0.022	0.027	0.032	0.043	0.048	0.050	0.054	0.060	0.070
Steels	32-40	1.5 x D	0.5 x D	1 x D	15	23	40	45	0.012	0.016	0.020	0.024	0.029	0.039	0.043	0.045	0.049	0.054	0.063
Stainless Steels		1.5 x D	0.5 x D	1 x D	10	15	25	35	0.011	0.015	0.019	0.023	0.027	0.037	0.041	0.043	0.046	0.050	0.060
Titanium	>40	1.5 x D	0.5 x D	1 x D	10	15	25	25	0.011	0.015	0.019	0.023	0.027	0.037	0.041	0.043	0.046	0.050	0.060

fz-feed per tooth in mm D-Diameter in mm										
20	22	24	25	28	30	32	35	36	40	50
0.090	0.096	0.102	0.108	0.096	0.096	0.102	0.108	0.120	0.120	0.120
0.081	0.086	0.092	0.097	0.086	0.086	0.092	0.107	0.108	0.108	0.108
0.073	0.077	0.083	0.087	0.077	0.077	0.083	0.083	0.097	0.097	0.097
0.070	0.073	0.079	0.079	0.073	0.079	0.079	0.079	0.092	0.092	0.092
0.070	0.073	0.079	0.079	0.073	0.079	0.079	0.079	0.092	0.092	0.092

For slotting : multiply by 0.6 the feed per tooth (fz) in the table.

# ➔ HSSE/HSS PM ROUGHERS & SEMI FINISHERS |

## RECOMMENDED WORKING DETAILS

### LISTS 6607 / 6608 / 6617 / 6618 |

Material	Rockwell Hardness	Application			Vc Cutting Speed			fz-feed per tooth in mm D - diameter in mm									
		Side Milling		slotting	m/min	m/min	m/min	6	8	10	12	16	20	25	28	30	36
	HRC	ap	ae	ap	Uncoated	TiCN	TiAlN										
Steels	<20	1.5xD	0.5xD	1xD	30	70	80	0.014	0.024	0.044	0.056	0.067	0.085	0.100	0.110	0.120	0.120
Steels	20-30	1.5xD	0.5xD	1xD	25	55	60	0.012	0.022	0.032	0.048	0.060	0.081	0.085	0.088	0.100	0.100
Cast Iron		1.5xD	0.5xD	1xD	25	55	60	0.012	0.022	0.032	0.048	0.060	0.081	0.085	0.088	0.100	0.100

For slotting : multiply by 0.6 the feed per tooth (f z) in the table.

### LIST 6645 |

Material	Rockwell Hardness	Application			VC-Cutting Speed				fz-feed per tooth in mm D-Diameter in mm										
		Side Milling		Slotting	m/min	m/min	m/min	m/min	6	7	8	9	10	11	12	13	14	16	18
	HRC	ap	ae	ap	uncoated	TiN	TiCN	TiAlN											
Steels		1.5 x D	0.5 x D	1 x D	30	45	70	90	0.015	0.020	0.024	0.030	0.036	0.048	0.054	0.056	0.060	0.066	0.078
Steels	20-30	1.5 x D	0.5 x D	1 x D	25	35	55	75	0.012	0.018	0.022	0.027	0.032	0.043	0.048	0.050	0.054	0.060	0.070
Steels	32-40	1.5 x D	0.5 x D	1 x D	15	23	35	45	0.012	0.016	0.020	0.024	0.029	0.039	0.043	0.045	0.049	0.054	0.063
Stainless Steels		1.5 x D	0.5 x D	1 x D	10	15	25	35	0.011	0.015	0.019	0.023	0.027	0.037	0.041	0.043	0.046	0.050	0.060
Titanium	>40	1.5 x D	0.5 x D	1 x D	10	15	20	25	0.011	0.015	0.019	0.023	0.027	0.037	0.041	0.043	0.046	0.050	0.060

fz-feed per tooth in mm D-Diameter in mm						
20	22	24	25	28	30	
0.090	0.096	0.102	0.108	0.096	0.096	
0.081	0.086	0.092	0.097	0.086	0.086	
0.073	0.077	0.083	0.087	0.077	0.077	
0.070	0.073	0.079	0.079	0.073	0.079	
0.070	0.073	0.079	0.079	0.073	0.079	

### LIST 6N04 |

Material	Rockwell Hardness	Application			Vc-Cutting Speed			fz-feed per tooth in mm D - diameter in mm						
		Side Milling		Slotting	m/min	m/min	m/min	6	8	10	12	16	20	25
	HRC	ap	ae	ap	Uncoated	TiCN	TiAlN							
Steels	<32	1.5xD	0.5xD	1xD	18	48	55	0.012	0.022	0.032	0.048	0.060	0.081	0.085
Steels	32-42	1.5xD	0.5xD	1xD	15	30	48	0.014	0.080	0.029	0.043	0.059	0.073	0.087
Cast Iron <180 HB		1.5xD	0.5xD	1xD	18	48	55	0.012	0.022	0.032	0.048	0.060	0.081	0.085
Cast Iron >180 HB		1.5xD	0.5xD	1xD	15	30	48	0.014	0.080	0.029	0.043	0.059	0.073	0.087
Stainless Steels		1.5xD	0.5xD	1xD	12	22	30	0.013	0.019	0.027	0.041	0.050	0.070	0.080
Titanium		1.5xD	0.5xD	0.5xD	10	18	25	0.011	0.018	0.025	0.040	0.047	0.066	0.075
High Temperature Alloys		1.5xD	0.5xD	0.25xD	7	11	15	0.014	0.018	0.029	0.043	0.059	0.073	0.087

### LIST 6N06 |

Material	Rockwell Hardness	Application			Vc-Cutting Speed			fz-feed per tooth in mm D - diameter in mm								
		Side Milling		Slotting	m/min	m/min	m/min	6	8	10	12	16	20	25	30	
	HRC	ap	ae	ap	Uncoated	TiCN	TiAlN									
Steels	<32	1.5xD	0.5xD	1xD	18	48	55	0.012	0.022	0.032	0.048	0.060	0.081	0.085	0.100	
Steels	32-42	1.5xD	0.5xD	1xD	15	30	48	0.014	0.080	0.029	0.043	0.059	0.073	0.087	0.077	
Cast Iron <180 HB		1.5xD	0.5xD	1xD	18	48	55	0.012	0.022	0.032	0.048	0.060	0.081	0.085	0.100	
Cast Iron >180 HB		1.5xD	0.5xD	1xD	15	30	48	0.014	0.080	0.029	0.043	0.059	0.073	0.087	0.077	
Stainless Steels		1.5xD	0.5xD	1xD	12	22	30	0.013	0.019	0.027	0.041	0.050	0.070	0.080	0.079	
Titanium		1.5xD	0.5xD	0.5xD	10	18	25	0.011	0.018	0.025	0.040	0.047	0.066	0.075	0.079	
High Temperature Alloys		1.5xD	0.5xD	0.25xD	7	11	15	0.014	0.018	0.029	0.043	0.059	0.073	0.087	0.077	

## RECOMMENDED WORKING DETAILS

### LIST 6N70 |

Material	Rockwell Hardness	Application			VC-Cutting Speed m/min	f z- feed per tooth in mm D-Diameter in mm						
		Side Milling		Slotting								
		ap	ae	ap	TiAlN	6	8	10	12	16	20	25
Steels	<20	1.5 x D	0.50 x D	1.0 x D	75-85	0.025	0.035	0.055	0.065	0.085	0.110	0.130
Steels	20-30	1.0 x D	0.40 x D	1.0 x D	65-75	0.023	0.032	0.052	0.062	0.082	0.100	0.120
Steels	32-40	1.0 x D	0.40 x D	1.0 x D	45-55	0.020	0.030	0.045	0.050	0.070	0.090	0.110
Tool Steels	32-40	1.0 x D	0.33 x D	0.75 x D	30-40	0.018	0.020	0.040	0.045	0.065	0.080	0.100
Titanium	>40	1.0 x D	0.25 x D	0.75 x D	15-20	0.020	0.030	0.045	0.050	0.070	0.090	0.110

For slotting: multiply by 0.8 the feed per tooth (f z) in the table.

HSSSE/HSS PM  
 ROUGHERS  
 & SEMI  
 FINISHERS

### LIST 6NL6 |

Material	Rockwell Hardness	Application			Vc-Cutting Speed			fz-feed per tooth in mm D - diameter in mm						
		Side Milling		Slotting	m/min	m/min	m/min							
		ap	ae	ap	Uncoated	TiCN	TiAlN	6	8	10	12	16	20	25
Steels	<32	1.5xD	0.5xD	1xD	18	48	55	0.010	0.019	0.027	0.041	0.051	0.069	0.072
Steels	32-42	1.5xD	0.5xD	1xD	15	30	48	0.012	0.068	0.025	0.037	0.050	0.062	0.074
Cast Iron <180 HB		1.5xD	0.5xD	1xD	18	48	55	0.010	0.019	0.027	0.041	0.051	0.069	0.072
Cast Iron >180 HB		1.5xD	0.5xD	1xD	15	30	48	0.012	0.068	0.025	0.037	0.050	0.062	0.074
Stainless Steels		1.5xD	0.5xD	1xD	12	22	30	0.011	0.016	0.023	0.035	0.043	0.060	0.068
Titanium		1.5xD	0.5xD	0.5xD	10	18	25	0.009	0.015	0.021	0.034	0.040	0.056	0.064
High Temperature Alloys		1.5xD	0.5xD	0.25xD	7	11	15	0.012	0.015	0.025	0.037	0.050	0.062	0.074

#### NOTE

Data shown is the result of actual machining tests and is suggested as a starting point. Do sensitivity analyses to achieve optimum results. The tests were run on an optimal machining environment.

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## → VARIMILL I



The true leader in the field of high performance, chatter free machining for use in the widest range of workpiece materials and types of operations. Utilizing an innovative and patented design, with unequal, yet constant flute spacing. VariMill carbide and HSS PM end mills provide users with the most versatile, end mill available, capable of outperforming most other high performance tools.

- Provides smooth, silent machining, maximizing productivity.
- Can be used as a rougher or a finisher.
- Is effective in slotting, profiling and pocketing operations.
- Effective in extreme conditions and at high surface speeds.
- Easy to resharpen and maintains performance.
- Outstanding performance in:

Stainless Steels

Cast Iron

High Temperature Alloys

Low Carbon Steels < 35 HRc

Titanium



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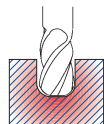
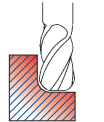
Description	LIST	Page
VariMill Ball, 4 Flutes Ball Nose High Helix With Neck	47N0	39
VariMill St S, 4 Flutes Square end High Helix	4777	39
VariMill Ti, 4 Flutes Square end High Helix	4778	40
VariMill PM, 4 Flutes Square end High Helix	1N77	40
Recommended Working Details		41-42



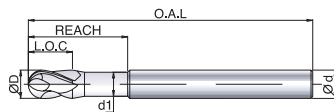
# → VARIMILL I

## VariMill Ball | 4 FLUTES BALL NOSE | HIGH HELIX WITH NECK LIST 47N0

for Slotting and Finishing various Materials.  
Extreme Performance Milling Stainless Steels,  
Titanium and High Temperature Alloys.

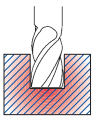
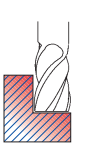


D(e8)	d	L.O.C	O.A.L	Reach	Z	ITEM No.
5	6	9	57	15	4	47N005002
6	6	10	57	15	4	47N006002
8	8	12	63	20	4	47N008003
10	10	14	72	25	4	47N010004
12	12	16	83	30	4	47N012005
16	16	22	92	38	4	47N016006
20	20	26	104	50	4	47N020007

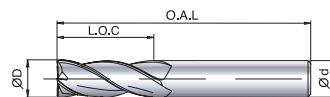


## VariMill St S | 4 FLUTES SQUARE END | HIGH HELIX LIST 4777

for Slotting and Finishing various Materials.  
Extreme Performance Milling Stainless  
Steels and High Temperature Alloys.



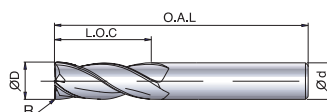
D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
4	6	12	55	4	477704002
5	6	13	57	4	477705002
6	6	13	57	4	477706002
7	8	16	63	4	477707003
8	8	16	63	4	477708003
9	10	19	72	4	477709004
10	10	22	72	4	477710004
12	12	26	83	4	477712005
14	14	26	83	4	477714014
16	16	32	92	4	477716006
18	18	32	92	4	477718018
20	20	38	104	4	477720007
25	25	45	121	4	477725008



for Slotting and Finishing various Materials.  
Extreme Performance Milling Titanium.

**VariMill Ti | 4 FLUTES SQUARE END | HIGH HELIX**  
**LIST 4778**

D(e8)	d	L.O.C	O.A.L	R	Z	ITEM No.
4	6	12	55	0.2	4	477804002
5	6	13	57	0.2	4	477805002
6	6	13	57	0.2	4	477806002
7	8	16	63	0.2	4	477807003
8	8	16	63	0.2	4	477808003
9	10	19	72	0.2	4	477809004
10	10	22	72	0.3	4	477810004
12	12	26	83	0.3	4	477812005
14	14	26	83	0.3	4	477814014
16	16	32	92	0.3	4	477816006
18	18	32	92	0.3	4	477818018
20	20	38	104	0.3	4	477820007
25	25	45	121	0.3	4	477825008



- PREMIUM CARBIDE
- 38°
- HANITA Standard
- Corner Radius
- AlTiN MT
- Ti
- INCONEL
- 30-ST HRc

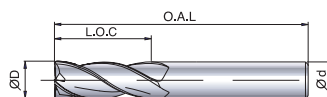


VARIMILL

for Slotting and Finishing various Materials.  
Extreme Performance Milling Stainless Steels,  
Titanium and High Temperature Alloys.

**VARIMILL-PM | 4 FLUTES SQUARE END | HIGH HELIX**  
**LIST 1N77**

D(+0.04)	d	L.O.C	O.A.L	Z	ITEM No.
6	6	13	57	4	1N7706002
8	10	19	69	4	1N7708004
10	10	22	72	4	1N7710004
12	12	26	83	4	1N7712005
14	12	26	83	4	1N7714005
16	16	32	92	4	1N7716006
18	16	32	92	4	1N7718006
20	20	38	104	4	1N7720007
22	20	38	104	4	1N7722007
25	25	45	121	4	1N7725008
30	25	45	121	4	1N7730008



- HSS-PM
- 38°
- HANITA Standard
- TICN CT, CW
- St S
- Ti
- INCONEL
- 30-ST HRc



## RECOMMENDED WORKING DETAILS

### FORMULAS

**Cutting Speed**  $V_c = \frac{D \times \pi \times n}{1000}$  (m/min)

**Spindle Speed**  $n = \frac{V_c \times 1000}{\pi \times d}$  (1/min)

**Feed per Tooth**  $f_z = \frac{V_f}{z \times n}$  (mm)

**Table Feed**  $V_f = f_z \times z \times n$  (mm/min)

### Formula Symbols:

D (mm) Tool diameter

z No. of Flutes

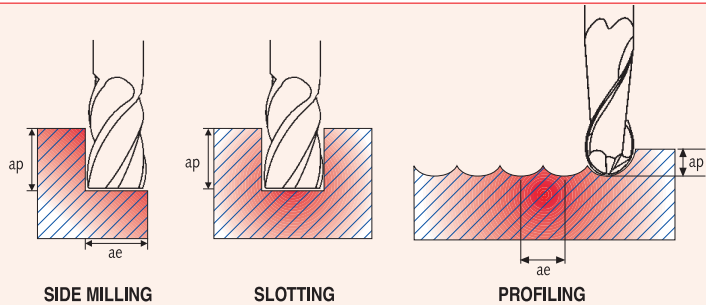
$V_c$  (m/min) Cutting Speed

$F_z$  (mm) Feed per Tooth

n (1/min) Spindle Speed

$V_f$  (mm/min) Table Feed

$\pi$  3.1416



## LIST 47N0 |

Material	Application			VC-Cutting Speed m/min TiAlN	fz- Feed per Tooth in mm D- Diameter in mm						
	Side milling		slotting		5	6	8	10	12	16	20
	ap	ae									
Easy to cut stainless steels (304)	1xD	0.5XD	1xD	80~100	0.027	0.036	0.045	0.054	0.059	0.063	0.068
Moderately difficult to cut stainless steels	1xD	0.4XD	1xD	60~75	0.023	0.032	0.041	0.045	0.050	0.054	0.059
Difficult to cut stainless steels (316L)	1xD	0.4XD	1xD	55~70	0.023	0.027	0.036	0.041	0.045	0.050	0.054
High temperature alloys	1xD	0.2XD	0.5XD	22~30	0.010	0.015	0.024	0.024	0.034	0.044	0.050
Soft Steels	1xD	0.5XD	1xD	135~160	0.027	0.036	0.054	0.054	0.063	0.068	0.081
Titanium	1xD	0.3XD	0.5XD	45~55	0.014	0.018	0.027	0.027	0.036	0.041	0.054
Gray Cast Iron	1xD	0.4XD	1xD	110~135	0.027	0.036	0.054	0.054	0.063	0.068	0.081

## LIST 4777 / 4778 |

Material	Application			VC-Cutting Speed m/min TiAlN/AlTiN	fz- Feed per Tooth in mm D- Diameter in mm									
	Side milling		slotting		4	5	6	8	10	12	16	18	20	25
	ap	ae												
Easy to cut stainless steels (304)	1xD	0.5XD	1xD	90~115	0.025	0.030	0.040	0.050	0.060	0.065	0.070	0.072	0.075	0.075
Moderately difficult to cut stainless steels	1xD	0.5XD	1xD	70~85	0.020	0.025	0.035	0.045	0.050	0.055	0.060	0.065	0.065	0.070
Difficult to cut stainless steels (316L)	1xD	0.5XD	1xD	60~80	0.015	0.025	0.030	0.040	0.045	0.050	0.055	0.060	0.060	0.060
High temperature alloys	1xD	0.2XD	0.3xD	25~35	0.011	0.011	0.017	0.027	0.027	0.038	0.049	0.055	0.055	0.055
Soft Steels	1xD	0.5XD	1xD	150~180	0.025	0.030	0.040	0.060	0.060	0.070	0.075	0.080	0.090	0.100
Titanium	1xD	0.5XD	1xD	50~60	0.012	0.015	0.020	0.030	0.030	0.040	0.045	0.050	0.060	0.070
Gray Cast Iron	1xD	0.5XD	1xD	120~150	0.025	0.030	0.040	0.060	0.060	0.070	0.075	0.080	0.090	0.100

## RECOMMENDED WORKING DETAILS

### LIST 1N77 I

Material	Application			VC-Cutting Speed m/min TiCN	fz- Feed per Tooth in mm D- Diameter in mm								
	Side milling		Slotting		6	8	10	12	16	18	20	25	30
	ap	ae											
Easy to cut stainless steels (304)	1xD	0.5XD		35~45	0.060	0.070	0.080	0.090	0.095	0.100	0.110	0.115	0.122
Moderately difficult to cut stainless steels	1xD	0.5XD		30~42	0.055	0.065	0.075	0.085	0.090	0.100	0.110	0.114	0.120
Difficult to cut stainless steels (316L)	1xD	0.5XD		20~38	0.050	0.060	0.070	0.080	0.085	0.090	0.100	0.110	0.120
Titanium	1xD	0.5XD		15~25	0.019	0.030	0.030	0.043	0.055	0.062	0.062	0.063	0.073
Soft Steels	1xD	0.5XD		40~50	0.045	0.067	0.067	0.078	0.084	0.090	0.101	0.115	0.132
High temperature alloys	1xD	0.3XD		8~15	0.022	0.034	0.034	0.045	0.050	0.056	0.067	0.081	0.093
Gray Cast Iron	1xD	0.4XD		40~50	0.045	0.067	0.067	0.078	0.084	0.090	0.101	0.115	0.132

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#### NOTE

Data shown is the result of actual machining tests and is suggested as a starting point. Do sensitivity analyses to achieve optimum results. The tests were run on an optimal machining environment.

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## → VISION PLUS |



Designed for optimum performance in machining hardened steels and ultra hardened materials, Vision Plus carbide end mills utilize special proprietary substrate materials, patented designs and a truly superb quality coating, combining a high level of hardness with extremely high stability. This enables maximum metal removal rates in materials up to 68 HRc, even in dry conditions, saving in coolant costs and protecting the environment.

- Perfect solutions for Mold & Die applications.
- Reduces machining costs by 50% compared to EDM.
- Excellent in long reach and Z-axis milling applications.
- Provides outstanding surface finish quality and straightness of deep walls.
- Available in many styles, including radius, ball nose, miniature, rib processing and roughing style tools.



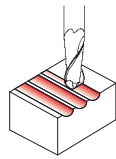
Description	LIST	Page
2 Flutes Ball Nose 15° Helix	7151	45
2 Flutes Ball Nose 15° Helix Taper	7061	45
2 Flutes Ball Nose 30° Helix With Neck	70N1	46
4 Flutes Ball Nose 15° Helix	7150	46
4 Flutes Ball Nose 15° Helix	7050/7060	47
2 Flutes Square end 30° Helix, Corner Radii and Neck	75N2	48
6 Flutes Square end 50° Helix, Corner Radii and Neck	75N8	48
Multi Flutes Square end, Corner Radii	7585/7595	49
Multi Flutes Square end	7505/7545	50
Multi Flutes Square end	7515/7525	50
Multi Flutes Square end, Corner Radii	75N5	51
Multi Flutes Square end, Corner Radii, Flat Shallow Profile	7670	52
2 Flutes Ball Nose, Short Neck, Micro	7N01	52
2 Flutes Square end, Short Neck, Micro	7N02	53
2 Flutes Square end, Very Long Neck, Micro	7N12	53
2 Flutes Square end, Extra Long Neck, Micro	7N22	54-55
Recommended Working Details		56-58



# → VISION PLUS |

## 2 FLUTES BALL NOSE | 15° HELIX LIST 7151

for Finishing in 3D Milling

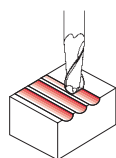


D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
1	3	3	38	2	715101000
2	3	3	38	2	715102000
2.5	3	3	38	2	715102500
3	3	3	38	2	715103000
4	4	4	50	2	715104001
5	5	5	50	2	715105001
6	6	6	50	2	715106002
8	8	8	63	2	715108003
10	10	10	76	2	715110004
12	12	12	76	2	715112005
16	16	16	89	2	715116006
20	20	20	104	2	715120007

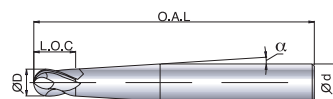


## 2 FLUTES BALL NOSE | 15° HELIX | TAPER ANGLE LIST 7061

for Deep 3D milling operation  
Additional strength due to the taper angle



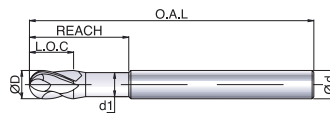
D(e8)	d	L.O.C	O.A.L	Z	α	ITEM No.
1	4	1	63	2	3.5	706101001
2	4	2	63	2	3.5	706102001
2.5	4	2.5	63	2	3	706102501
3	6	3	75	2	1.5	706103002
4	6	4	75	2	1.5	706104002
5	6	5	75	2	1.5	706105002
6	10	6	100	2	1.5	706106004
8	10	8	100	2	1.5	706108004
10	12	10	125	2	1.5	706110005
12	16	12	125	2	1.5	706112006



for Deep 3D milling operation

**2 FLUTES BALL NOSE | 30° HELIX | WITH NECK**  
**LIST 70N1**

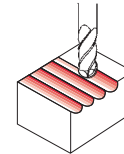
D(e8)	d	L.O.C	O.A.L	Z	REACH	D1	ITEM No.
1	4	1	63	2	3	0.8	70N101001
1.5	4	1.5	63	2	4.5	1.3	70N101501
2	6	2	76	2	6	1.8	70N102002
3	6	3	76	2	9	2.8	70N103002
4	6	4	76	2	12	3.7	70N104002
5	6	5	76	2	15	4.6	70N105002
6	6	6	76	2	18	5.5	70N106002
8	8	8	100	2	24	7.4	70N108003
10	10	10	100	2	30	9.2	70N110004
12	12	12	125	2	36	11	70N112005



PREMIUM CARBIDE 30°

HANITA Standard

TiAIN RT



ST>45 HRc

30<ST<45 HRc



VISION PLUS

for finishing in 3D milling

**4 FLUTES BALL NOSE | 15° HELIX**  
**LIST 7150**

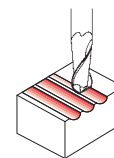
D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
2	3	2	38	4	715002000
2.5	3	3	38	4	715002500
3	3	3	38	4	715003000
4	4	4	50	4	715004001
5	5	5	50	4	715005001
6	6	6	50	4	715006002
8	8	8	63	4	715008003
10	10	10	76	4	715010004
12	12	12	76	4	715012005
16	16	16	89	4	715016006
20	20	20	104	4	715020007



PREMIUM CARBIDE 15°

HANITA Standard

TiAIN RT



ST>45 HRc

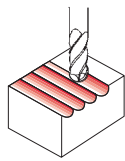
30<ST<45 HRc



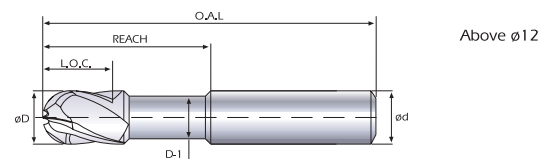
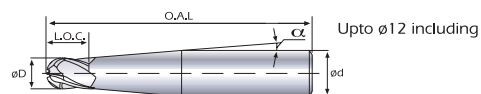
# → VISION PLUS |

## 4 FLUTES BALL NOSE | 15° HELIX LISTS 7050 / 7060

for Deep 3D milling operation



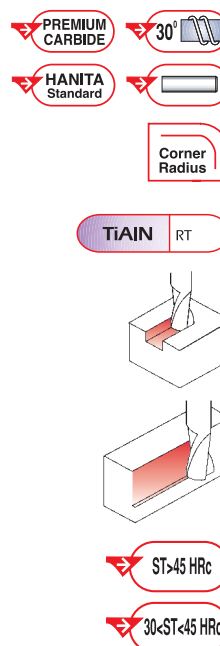
D(e8)	d	L.O.C	O.A.L	Z	$\alpha$	ITEM No.
2	4	2	63	4	2.5	705002001
2	4	2	63	4	3.5	706002001
2.5	4	2.5	63	4	2.5	705002501
2.5	4	2.5	63	4	3	706002501
3	6	3	75	4	2.5	705003002
3	6	3	75	4	2.5	706003002
4	6	4	75	4	2.5	705004002
4	6	4	75	4	2	706004002
5	6	5	75	4	2.5	705005002
5	6	5	75	4	1.5	706005002
6	10	6	100	4	2.5	705006004
6	10	6	100	4	1.5	706006004
8	10	8	100	4	2.5	705008004
8	10	8	100	4	1.5	706008004
10	12	10	125	4	2.5	705010005
10	12	10	125	4	1.5	706010005
12	16	12	125	4	2.5	705012006
12	16	12	125	4	1.5	706012006
16	16	16	125	4		705016006
20	20	20	150	4		705020007



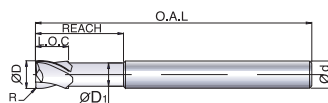
for Deep slotting and finishing operations

**2 FLUTES SQUARE END | 30° HELIX | CORNER RADI AND NECK  
LIST 75N2**

D(e8)	d	L.O.C	O.A.L	Z	R	REACH	D1	ITEM No.
3	6	3	75	2	0.3	9	2.8	75N203022
3	6	3	75	2	0.5	9	2.8	75N203042
3	6	3	75	2	1.0	9	2.8	75N203062
4	6	4	75	2	0.3	12	3.7	75N204022
4	6	4	75	2	0.5	12	3.7	75N204042
4	6	4	75	2	1.0	12	3.7	75N204062
5	6	5	75	2	0.3	15	4.6	75N205022
5	6	5	75	2	1.0	15	4.6	75N205042
6	6	6	75	2	0.3	18	5.5	75N206032
6	6	6	75	2	0.5	18	5.5	75N206042
6	6	6	75	2	0.75	18	5.5	75N206052
6	6	6	75	2	1.0	18	5.5	75N206062
6	6	6	75	2	1.5	18	5.5	75N206072
8	8	8	100	2	0.5	24	7.4	75N208023
8	8	8	100	2	1.0	24	7.4	75N208043
8	8	8	100	2	1.5	24	7.4	75N208063
10	10	10	100	2	0.5	30	9.2	75N210024
10	10	10	100	2	0.75	30	9.2	75N210034
10	10	10	100	2	1.0	30	9.2	75N210044
10	10	10	100	2	2.0	30	9.2	75N210064
12	12	12	125	2	0.5	36	11	75N212025
12	12	12	125	2	0.75	36	11	75N212035
12	12	12	125	2	1.0	36	11	75N212045
12	12	12	125	2	1.5	36	11	75N212055
12	12	12	125	2	2.0	36	11	75N212065



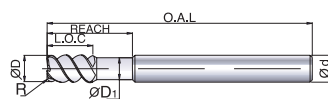
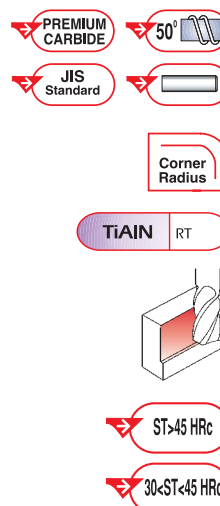
VISION PLUS



for Peripheral high finishing accuracy operation

**6 FLUTES SQUARE END | 50° HELIX | CORNER RADI AND NECK  
LIST 75N8**

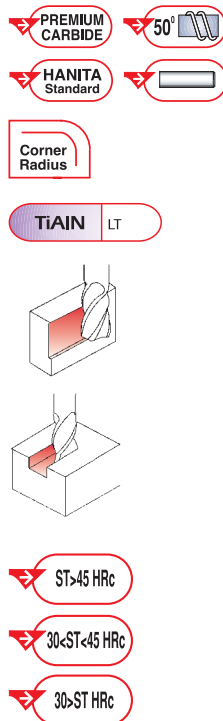
D(e8)	d	L.O.C	O.A.L	R	Z	REACH	D1	ITEM No.
6	6	6	76	0.5	6	18	5.5	75N806002
8	8	8	100	0.5	6	24	7.4	75N808003
10	10	10	100	1.0	6	30	9.2	75N810004
12	12	12	125	1.0	6	36	11	75N812005



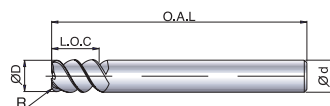
# → VISION PLUS |

## MULTI-FLUTES SQUARE END | CORNER RADII LISTS 7585 / 7595

for Deep Slotting and Peripheral  
Milling of Hard Steels



D(e8)	d	L.O.C	O.A.L	R	Z	ITEM No.
3	6	4.5	50	0.25	4	759503002
3	6	4.5	50	0.5	4	759503012
4	6	6	50	0.25	4	759504002
4	6	6	50	0.5	4	759504012
5	6	7.5	50	0.25	4	759505002
5	6	7.5	50	0.5	4	759505012
6	6	9	50	0.25	4	759506002
6	6	9	50	0.5	4	759506012
6	6	9	50	0.75	4	759506022
6	6	9	50	1.0	4	759506032
6	6	9	76	0.25	4	758506002
6	6	9	76	0.5	4	758506012
8	8	12	63	0.5	4	759508003
8	8	12	63	1.0	4	759508013
8	8	12	63	0.75	4	759508023
8	8	12	63	1.5	4	759508033
8	8	12	100	0.5	4	758508003
8	8	12	100	1.0	4	758508013
10	10	15	76	0.5	4	759510004
10	10	15	76	1.0	4	759510014
10	10	15	76	1.5	4	759510024
10	10	15	76	2.0	4	759510034
10	10	15	100	0.5	4	758510004
10	10	15	100	1.0	4	758510014
12	12	18	76	0.5	4	759512005
12	12	18	76	1.5	4	759512015
12	12	18	76	1.0	4	759512025
12	12	18	76	2.0	4	759512035
12	12	18	125	0.5	4	758512005
12	12	18	125	1.5	4	758512015
16	16	24	89	0.5	4	759516006
16	16	24	89	1.5	4	759516016
16	16	24	89	2.0	4	759516036
16	16	24	125	0.5	4	758516006
16	16	24	125	1.5	4	758516016
20	20	30	104	0.5	4	759520007
20	20	30	104	2.0	4	759520017
20	20	30	104	1.0	4	759520027
20	20	30	150	0.5	4	758520007
20	20	30	150	2.0	4	758520017
25	25	38	121	0.5	5	759525008
25	25	38	121	3.0	5	759525018
25	25	38	150	0.5	5	758525008
25	25	38	150	3.0	5	758525018



for Deep Slotting and Peripheral  
Milling of Hard Steels

**MULTI-FLUTES SQUARE END  
LISTS 7505 / 7545**

D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	4.5	50	4	754503002
3	6	4.5	57	4	750503002
4	6	6	50	4	754504002
4	6	6	57	4	750504002
5	6	7.5	50	4	754505002
5	6	7.5	76	4	750505002
6	6	9	50	4	754506002
6	6	9	76	4	750506002
8	8	12	63	4	754508003
8	8	12	100	4	750508003
10	10	15	76	4	754510004
10	10	15	100	4	750510004
12	12	18	76	4	754512005
12	12	18	125	4	750512005
16	16	24	89	4	754516006
16	16	24	125	4	750516006
20	20	30	104	4	754520007
20	20	30	150	4	750520007
25	25	38	121	5	754525008
25	25	38	150	5	750525008

PREMIUM CARBIDE 50°

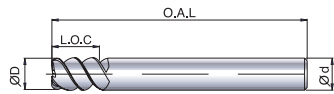
HANITA Standard

TiAlN LT

ST>45 HRc

30<ST<45 HRc

30>ST HRc



VISION PLUS

for Shallow Slotting and Peripheral  
Deep Milling of Hard Steels

**MULTI-FLUTES SQUARE END  
LISTS 7515 / 7525**

D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
6	6	15	76	4	751506002
6	6	21	76	4	752506002
8	8	20	100	4	751508003
8	8	28	100	4	752508003
10	10	25	100	5	751510004
10	10	35	100	5	752510004
12	12	30	125	6	751512005
12	12	42	125	6	752512005
16	16	40	125	6	751516006
16	16	56	125	6	752516006
20	20	50	150	6	751520007
20	20	70	150	6	752520007
25	25	63	150	6	751525008
25	25	88	150	6	752525008

PREMIUM CARBIDE 50°

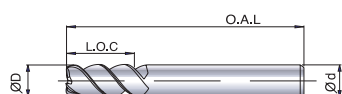
HANITA Standard

TiAlN LT

ST>45 HRc

30<ST<45 HRc

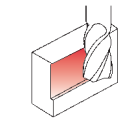
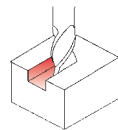
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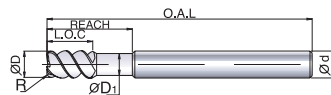
# → VISION PLUS |

## MULTI-FLUTES SQUARE END | CORNER RADII LIST 75N5

for Deep Slotting and Peripheral  
Milling of Hard Steels, Long Reach



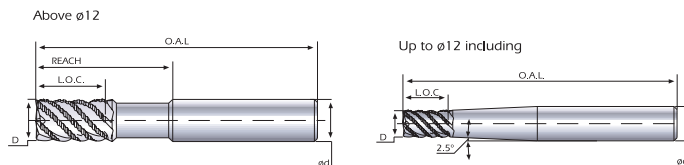
D(e8)	d	L.O.C	O.A.L	R	Z	Reach	D1	ITEM No.
3	6	4.5	57	0.25	4	9	2.7	75N503022
3	6	4.5	57	0.5	4	9	2.7	75N503042
4	6	6	57	0.25	4	12	3.7	75N504022
4	6	6	57	0.5	4	12	3.7	75N504042
5	6	7.5	76	0.25	4	15	4.6	75N505022
5	6	7.5	76	0.5	4	15	4.6	75N505042
6	6	9	76	0	4	18	5.5	75N506002
6	6	9	76	0.25	4	18	5.5	75N506022
6	6	9	76	0.5	4	18	5.5	75N506042
6	6	9	76	0.75	4	18	5.5	75N506062
6	6	9	76	1.0	4	18	5.5	75N506082
8	8	12	100	0	4	24	7.4	75N508003
8	8	12	100	0.5	4	24	7.4	75N508023
8	8	12	100	1.0	4	24	7.4	75N508033
8	8	12	100	1.5	4	24	7.4	75N508043
8	8	12	100	2.0	4	24	7.4	75N508053
10	10	15	100	0	4	30	9.4	75N510004
10	10	15	100	0.5	4	30	9.2	75N510024
10	10	15	100	1.0	4	30	9.2	75N510034
10	10	15	100	1.5	4	30	9.2	75N510044
10	10	15	100	2.0	4	30	9.2	75N510054
12	12	18	125	0	4	36	11.4	75N512005
12	12	18	125	0.5	4	36	11	75N512025
12	12	18	125	1.0	4	36	11	75N512035
12	12	18	125	1.5	4	36	11	75N512045
12	12	18	125	2.0	4	36	11	75N512055
16	16	24	125	0	4	48	15.4	75N516006
16	16	24	125	0.5	4	48	15	75N516026
16	16	24	125	1.5	4	48	15	75N516046
20	20	30	150	0	4	60	19.4	75N520007
20	20	30	150	0.5	4	60	19	75N520027
20	20	30	150	2.0	4	60	19	75N520047
25	25	38	150	0	5	75	24.4	75N525008
25	25	38	150	0.5	5	75	24	75N525028
25	25	38	150	3	5	75	24	75N525048



for Roughing in 3D Milling

**MULTI-FLUTES SQUARE END | CORNER RADIUS | FLAT SHALLOW PROFILE**  
**LIST 7670**

D(d11)	d	L.O.C	O.A.L	R	Z	ITEM No.
4	6	4	75	0.75	3	767004002
5	6	5	75	0.75	3	767005002
6	10	6	100	0.75	4	767006004
8	10	8	100	0.75	4	767008004
10	12	10	125	0.75	4	767010005
12	16	12	125	1.0	4	767012006
16	16	16	125	1.0	6	767016006
20	20	20	150	1.25	6	767020007
25	25	25	150	1.25	6	767025008

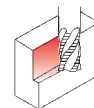
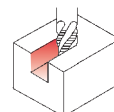


PREMIUM CARBIDE 45°

HANITA Standard

Corner Radius

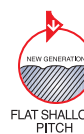
TiAIN LT



ST>45 HRC

30<ST<45 HRC

30>ST HRC



NEW GENERATION  
FLAT SHALLOW  
PITCH

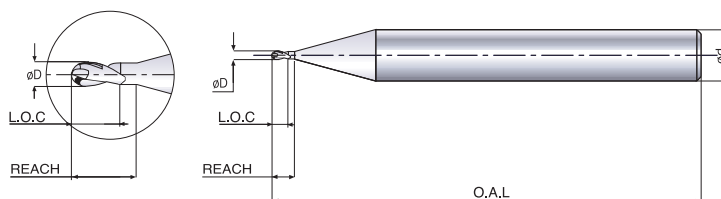


VISION PLUS

for Milling on precision machining centers

**2 FLUTES BALL NOSE | SHORT NECK | MICRO**  
**LIST 7N01**

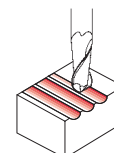
D(e8)	Reach	d	D1	L.O.C	O.A.L	ITEM No.
0.3		6		0.3	50	7N0100302
0.4		6		0.4	50	7N0100402
0.5	1.5	6	0.45	0.5	50	7N0100502
0.6	1.8	6	0.55	0.6	50	7N0100602
0.8	2.4	6	0.75	0.8	50	7N0100802
1.0	2.5	6	0.95	1.0	50	7N0101002
1.2	3.0	6	1.15	1.2	50	7N0101202
1.4	3.5	6	1.35	1.4	50	7N0101402
1.5	3.8	6	1.45	1.5	50	7N0101502
1.6	4.0	6	1.55	1.6	50	7N0101602
1.8	4.5	6	1.75	1.8	50	7N0101802
2.0	5.0	6	1.95	2.0	50	7N0102002
2.5	5.0	6	2.4	2.5	50	7N0102502
3.0	6.0	6	2.85	3.0	50	7N0103002
4.0	6.0	6	3.85	4.0	50	7N0104002
6.0	9.0	6	5.85	6.0	50	7N0106002



PREMIUM CARBIDE 30°

JIS Standard

TiAIN RJ



GRAPHITE

ST>45 HRC

30<ST<45 HRC

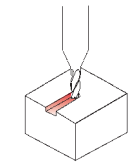
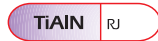
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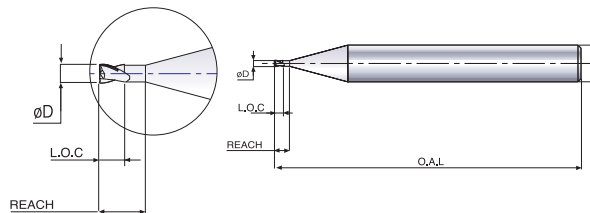
# → VISION PLUS |

## 2 FLUTES SQUARE END | SHORT NECK | MICRO LIST 7N02

for Milling on precision machining centers

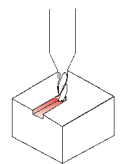
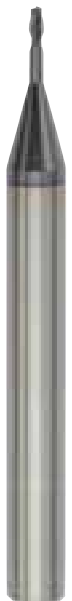


D(e8)	Reach	d	D1	L.O.C	O.A.L	ITEM No.
0.3		6		0.4	50	7N0200302
0.4		6		0.6	50	7N0200402
0.5	1.5	6	0.45	0.7	50	7N0200502
0.6	1.8	6	0.55	0.9	50	7N0200602
0.8	2.4	6	0.75	1.2	50	7N0200802
1.0	2.5	6	0.95	1.5	50	7N0201002
1.2	3.0	6	1.15	1.8	50	7N0201202
1.4	3.5	6	1.35	2.1	50	7N0201402
1.5	3.8	6	1.45	2.3	50	7N0201502
1.6	4.0	6	1.55	2.4	50	7N0201602
1.8	4.5	6	1.75	2.7	50	7N0201802
2.0	5.0	6	1.95	3.0	50	7N0202002
2.5	5.0	6	2.4	3.7	50	7N0202502

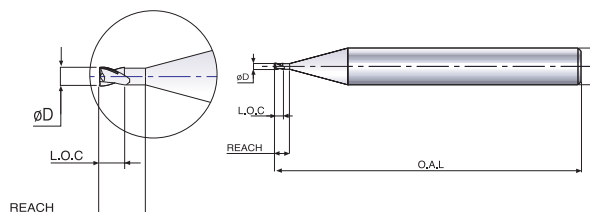


## 2 FLUTES SQUARE END | VERY LONG NECK | MICRO LIST 7N12

for Milling on precision machining centers



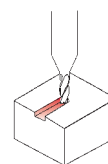
D(e8)	Reach	d	D1	L.O.C	O.A.L	ITEM No.
0.5	2.5	6	0.45	0.7	60	7N1200502
0.6	3.0	6	0.55	0.9	60	7N1200602
0.8	4.0	6	0.75	1.2	60	7N1200802
1.0	5.0	6	0.95	1.5	60	7N1201002
1.2	6.0	6	1.15	1.8	60	7N1201202
1.4	7.0	6	1.35	2.1	60	7N1201402
1.5	7.5	6	1.45	2.3	60	7N1201502
1.6	8.0	6	1.55	2.4	60	7N1201602
1.8	9.0	6	1.75	2.7	60	7N1201802
2.0	10.0	6	1.95	3.0	60	7N1202002
2.5	12.5	6	2.4	3.7	60	7N1202502



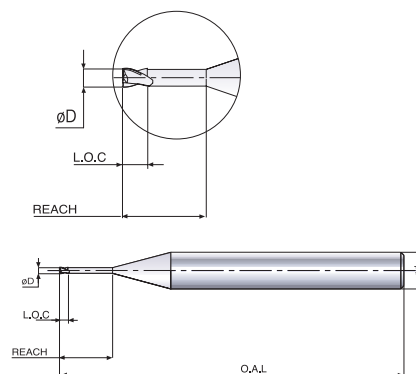
for Rib processing and very fine operations

## 2 FLUTES SQUARE END | EXTRA LONG NECK | MICRO LIST 7N22

D(ø8)	Reach	d	D1	L.O.C	O.A.L	ITEM No.
0.4	2	3	0.36	0.6	38	7N2200400
0.4	4	3	0.36	0.6	38	7N2200410
0.5	2	3	0.45	0.7	38	7N2200500
0.5	4	3	0.45	0.7	38	7N2200510
0.5	6	3	0.45	0.7	38	7N2200520
0.6	2	3	0.55	0.9	38	7N2200600
0.6	4	3	0.55	0.9	38	7N2200610
0.6	6	3	0.55	0.9	38	7N2200620
0.7	2	4	0.65	1	50	7N2200701
0.7	4	4	0.65	1	50	7N2200711
0.7	6	4	0.65	1	50	7N2200721
0.8	4	4	0.75	1.2	50	7N2200801
0.8	6	4	0.75	1.2	50	7N2200811
0.8	8	4	0.75	1.2	50	7N2200821
0.9	6	4	0.85	1.35	50	7N2200901
0.9	8	4	0.85	1.35	50	7N2200911
0.9	10	4	0.85	1.35	50	7N2200921
1	6	4	0.97	1.5	50	7N2201001
1	8	4	0.95	1.5	50	7N2201011
1	10	4	0.95	1.5	50	7N2201021
1	12	4	0.93	1.5	50	7N2201031
1.2	6	4	1.17	1.5	50	7N2201201
1.2	8	4	1.15	1.8	50	7N2201211
1.2	10	4	1.15	1.8	50	7N2201221
1.2	12	4	1.13	1.8	50	7N2201231
1.4	6	4	1.37	2.1	50	7N2201401
1.4	8	4	1.35	2.1	50	7N2201411
1.4	10	4	1.35	2.1	50	7N2201421
1.4	12	4	1.33	2.1	50	7N2201431
1.4	16	4	1.31	2.1	50	7N2201441
1.5	6	4	1.47	2.3	50	7N2201501
1.5	10	4	1.45	2.3	50	7N2201511
1.5	12	4	1.43	2.3	50	7N2201521
1.5	16	4	1.41	2.3	50	7N2201531
1.5	18	4	1.41	2.3	63	7N2201541
1.5	20	4	1.39	2.3	63	7N2201551
1.6	6	4	1.57	2.4	50	7N2201601
1.6	10	4	1.55	2.4	50	7N2201611
1.6	12	4	1.53	2.4	50	7N2201621
1.6	16	4	1.51	2.4	50	7N2201631
1.6	20	4	1.49	2.4	63	7N2201641
1.7	6	4	1.67	2.6	50	7N2201701
1.7	10	4	1.65	2.6	50	7N2201711
1.7	12	4	1.63	2.6	50	7N2201721
1.7	16	4	1.61	2.6	50	7N2201731
1.7	20	4	1.59	2.6	63	7N2201741
1.8	6	4	1.77	2.7	50	7N2201801
1.8	10	4	1.75	2.7	50	7N2201811
1.8	12	4	1.73	2.7	50	7N2201821
1.8	16	4	1.71	2.7	50	7N2201831
1.8	20	4	1.69	2.7	50	7N2201841
1.9	6	4	1.87	2.8	50	7N2201901
1.9	10	4	1.85	2.8	50	7N2201911
1.9	12	4	1.83	2.8	50	7N2201921
1.9	16	4	1.81	2.8	50	7N2201931
1.9	20	4	1.79	2.8	63	7N2201941
2	6	4	1.97	3	50	7N2202001
2	10	4	1.95	3	50	7N2202011
2	16	4	1.91	3	50	7N2202021
2	20	4	1.89	3	63	7N2202031
2	30	4	1.89	3	75	7N2202041



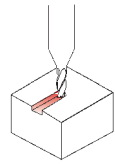
VISION PLUS



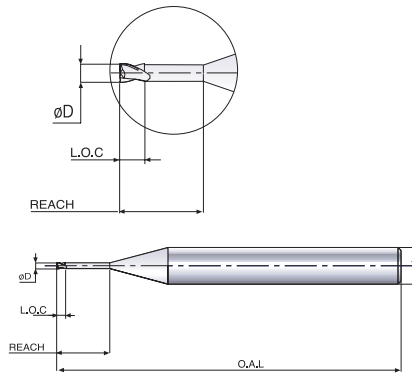
# ➔ VISION PLUS I

## 2 FLUTES SQUARE END | EXTRA LONG NECK | MICRO LIST 7N22

for Rib processing and very fine operations



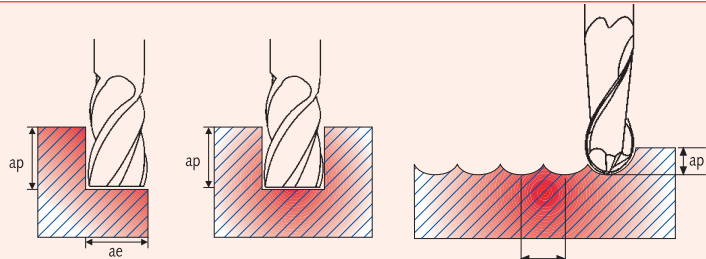
D(e8)	Reach	d	D1	L.O.C	O.A.L	ITEM No.
2.5	8	4	2.4	3.7	50	7N2202501
2.5	10	4	2.4	3.7	50	7N2202511
2.5	16	4	2.4	3.7	63	7N2202521
2.5	20	4	2.4	3.7	63	7N2202531
2.5	30	4	2.4	3.7	80	7N2202541
3	8	6	2.85	4.5	50	7N2203002
3	10	6	2.85	4.5	50	7N2203012
3	16	6	2.85	4.5	63	7N2203022
3	20	6	2.85	4.5	63	7N2203032
3	30	6	2.85	4.5	80	7N2203042



## RECOMMENDED WORKING DETAILS

### FORMULAS

<b>Cutting Speed</b>	$V_c = \frac{D \times \pi \times n}{1000}$ (m/min)	<b>Formula Symbols:</b>	D (mm) Tool diameter
<b>Spindle Speed</b>	$n = \frac{V_c \times 1000}{\pi \times d}$ (1/min)		z No. of Flutes
<b>Feed per Tooth</b>	$f_z = \frac{V_f}{z \times n}$ (mm)		$V_c$ (m/min) Cutting Speed
<b>Table Feed</b>	$V_f = f_z \times z \times n$ (mm/min)		$F_z$ (mm) Feed per Tooth
			n (1/min) Spindle Speed
			$V_f$ (mm/min) Table Feed
			$\pi$ 3.1416



SIDE MILLING

SLOTING

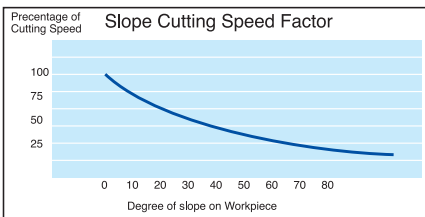
PROFILING

## LISTS 7050 / 7150 / 7151

→ Profiling

Material	Rockwell Hardness	Finishing		Semi Finishing		Roughing		Vc - Cutting Speed TiAlN m/min			fz - Feed per tooth in mm D - Diameter in mm										
		ap	ae	ap	ae	ap	ae	Finishing	Semi-finishing	Roughing	2	2.5	3	4	5	6	8	10	12	16	20
											0.050	0.060	0.080	0.120	0.150	0.200	0.200	0.220	0.240	0.260	0.300
Steels	<30	0.01 x D	0.01 x D	0.05 x D	0.05 x D	0.10 x D	0.10 x D	3000	1500	1000	0.050	0.060	0.080	0.120	0.150	0.200	0.200	0.220	0.240	0.260	0.300
Steels	30-40	0.01 x D	0.01 x D	0.05 x D	0.05 x D	0.10 x D	0.07 x D	2400	1200	800	0.040	0.050	0.060	0.100	0.130	0.180	0.180	0.200	0.220	0.240	0.280
Steels	40-50	0.01 x D	0.01 x D	0.05 x D	0.05 x D	0.10 x D	0.05 x D	1500	750	500	0.040	0.040	0.060	0.070	0.080	0.100	0.120	0.140	0.160	0.180	0.200
Steels	50-60	0.01 x D	0.01 x D	0.04 x D	0.04 x D	0.05 x D	0.05 x D	1200	600	400	0.030	0.030	0.040	0.050	0.050	0.060	0.070	0.070	0.080	0.090	0.100
Steels	60-70	0.01 x D	0.01 x D	0.03 x D	0.03 x D	0.05 x D	0.03 x D	900	500	300	0.020	0.020	0.030	0.040	0.040	0.050	0.060	0.060	0.070	0.080	0.080

Cutting data is for ap and ae equal 0.01D, for every 0.01D of dia. addition to ap, decrease feed per tooth by 3%.  
Cutting data is for dry machining or mist cooling.  
Use the diagram to determine cutting speed incase of slopes on workpiece.



VISION PLUS

## LISTS 70N1 / 7060 / 7061

→ Profiling

Material	Rockwell Hardness	Finishing		Semi finishing		Roughing		Vc - Cutting speed TiAlN m/min			fz - Feed per tooth in mm D - Diameter in mm										
		ap	ae	ap	ae	ap	ae	Finishing	Semi-finishing	Roughing	2	2.5	3	4	5	6	8	10	12	16	20
											0.050	0.060	0.080	0.120	0.150	0.200	0.200	0.220	0.240	0.260	0.300
STEELS	<30	0.01 x D	0.01 x D	0.05 x D	0.05 x D	0.10 x D	0.10 x D	3000	1500	1000	0.050	0.060	0.080	0.120	0.150	0.200	0.200	0.220	0.240	0.260	0.300
STEELS	30-40	0.01 x D	0.01 x D	0.05 x D	0.05 x D	0.10 x D	0.07 x D	2400	1200	800	0.040	0.050	0.060	0.100	0.130	0.180	0.180	0.200	0.220	0.240	0.280
STEELS	40-50	0.01 x D	0.01 x D	0.05 x D	0.05 x D	0.10 x D	0.05 x D	1500	750	500	0.040	0.040	0.060	0.070	0.080	0.100	0.120	0.140	0.160	0.180	0.200
STEELS	50-60	0.01 x D	0.01 x D	0.04 x D	0.04 x D	0.05 x D	0.05 x D	1200	600	400	0.030	0.030	0.040	0.050	0.050	0.060	0.070	0.070	0.080	0.090	0.100
STEELS	60-70	0.01 x D	0.01 x D	0.03 x D	0.03 x D	0.05 x D	0.03 x D	900	500	300	0.020	0.020	0.030	0.040	0.040	0.050	0.060	0.060	0.070	0.080	0.080

Cutting data is for ap and ae equal 0.01D, for every 0.01D of dia. addition to ap, decrease feed per tooth by 3%.  
Cutting data is for dry machining or mist cooling.  
Use the diagram to determine cutting speed incase of slopes on workpiece.

## LIST 75N2

→ Conventional milling

Material	Rockwell Hardness	Application			Vc-Cutting Speed m/min	fz - feed per tooth in mm D-Diameter in mm				
		Side Milling	Slotting	ap		TiAlN				
					ap	ae	ap	4	6	8
Steels	<45	1xD	0.05xD	~1xD	220	0.019	0.028	0.033	0.035	0.041
Steels	45-55	1xD	0.05xD	~0.05xD	120-180	0.019	0.028	0.033	0.035	0.041
Steels	55-60	1xD	0.05xD	~0.05xD	80-120	0.017	0.025	0.030	0.032	0.038
Steels	60-65	1xD	~0.2 mm	~0.05xD	50-80	0.016	0.024	0.029	0.031	0.036
Steels	65-70	1xD	~0.2 mm	~0.05xD	20-50	0.015	0.023	0.028	0.031	0.035

→ HSM milling

Material	Rockwell Hardness	Application			Cutting Speed m/min	fz - feed per tooth in mm D-Diameter in mm				
		Side Milling	Slotting	ap		TiAlN				
					ap	ae	ap	4	6	8
Steels	45-55	1xD	0.05xD	~0.05xD	~300	0.041	0.061	0.081	0.100	0.11
Steels	55-60	1xD	0.5 mm	~0.05xD	~150	0.040	0.060	0.080	0.098	0.10
Steels	60-65	1xD	0.2 mm	~0.05xD	~75	0.038	0.058	0.078	0.095	0.10

RECOMMENDED WORKING DETAILS

LIST 75N8 I

➔ Conventional milling

Material	Rockwell Hardness	Application			Vc-Cutting Speed m/min	fz- feed per tooth in mm D-Diameter in mm					
		Side Milling		Slotting		TiAlN	4	6	8	10	12
		ap	ae								
Steels	45-55	1xD	0.05xD	~0.05xD	120-180	0.019	0.028	0.033	0.035	0.041	
Steels	55-60	1xD	0.05xD	~0.05xD	80-120	0.017	0.025	0.030	0.032	0.038	
Steels	60-65	1xD	~0.2 mm	~0.05xD	50-80	0.016	0.024	0.029	0.031	0.036	
Steels	65-70	1xD	~0.2 mm	~0.05xD	20-50	0.015	0.023	0.028	0.031	0.035	

➔ HSM milling

Material	Rockwell Hardness	Application			Vc-Cutting Speed m/min	fz- feed per tooth in mm D-Diameter in mm					
		Side Milling		Slotting		TiAlN	4	6	8	10	12
		ap	ae								
Steels	45-55	1xD	0.05xD	~0.05xD	~300	0.041	0.061	0.081	0.100	0.11	
Steels	55-60	1xD	0.5 mm	~0.05xD	~150	0.040	0.060	0.080	0.098	0.10	
Steels	60-65	1xD	0.2 mm	~0.05xD	~75	0.038	0.058	0.078	0.095	0.10	

LISTS 7505 / 7585 / 75N5 I

➔ Roughing

Material	Rockwell Hardness	Application			Vc-Cutting Speed m/min	fz- feed per tooth in mm D-Diameter in mm								
		Side Milling		Slotting		TiAlN	3	6	8	10	12	16	20	25
		ap	ae											
Steels	< 30	1 x D	0.2 x D	0.5 x D	200	0.040	0.055	0.070	0.090	0.110	0.150	0.180	0.200	
Steels	30-40	1 x D	0.2 x D	0.5 x D	180	0.030	0.050	0.060	0.085	0.100	0.140	0.170	0.190	
Steels	40-45	1 x D	0.2 x D	0.5 x D	160	0.025	0.040	0.055	0.070	0.080	0.110	0.130	0.170	
Steels	45-50	1 x D	0.2 x D	0.5 x D	120	0.020	0.030	0.045	0.055	0.070	0.090	0.110	0.140	
Steels	50-55	1 x D	0.2 x D	0.5 x D	80	0.015	0.020	0.030	0.040	0.045	0.060	0.075	0.090	
Steels	> 55	1 x D	0.2 x D	0.25 x D	70	0.010	0.015	0.020	0.030	0.035	0.050	0.060	0.070	

➔ Finishing

Material	Rockwell Hardness	Application			Vc-Cutting Speed m/min	fz- feed per tooth in mm D-Diameter in mm								
		Side Milling		Slotting		TiAlN	3	6	8	10	12	16	20	25
		ap	ae											
Steels	< 30	1.5 x D	0.1 x D	0.1 x D	200	0.040	0.055	0.070	0.090	0.110	0.150	0.180	0.200	
Steels	30-40	1.5 x D	0.1 x D	0.1 x D	180	0.030	0.050	0.060	0.085	0.100	0.140	0.170	0.190	
Steels	40-45	1.5 x D	0.1 x D	0.1 x D	160	0.025	0.040	0.055	0.070	0.080	0.110	0.130	0.170	
Steels	45-50	1.5 x D	0.1 x D	0.1 x D	120	0.020	0.030	0.045	0.055	0.070	0.090	0.110	0.140	
Steels	50-55	1.5 x D	0.1 x D	0.1 x D	80	0.015	0.020	0.030	0.040	0.045	0.060	0.075	0.090	
Steels	> 55	1.5 x D	0.1 x D	0.1 x D	70	0.010	0.015	0.020	0.030	0.035	0.050	0.060	0.070	

LISTS 7515 / 7525 I

➔ Roughing

Material	Rockwell Hardness	Application			Vc-Cutting Speed m/min	fz- feed per tooth in mm D-Diameter in mm								
		Side Milling		Slotting		TiAlN	3	6	8	10	12	16	20	25
		ap	ae											
Steels	< 30	1 x D	0.2 x D	0.5 x D	200	0.040	0.055	0.070	0.090	0.110	0.150	0.180	0.200	
Steels	30-40	1 x D	0.2 x D	0.5 x D	180	0.030	0.050	0.060	0.085	0.100	0.140	0.170	0.190	
Steels	40-45	1 x D	0.2 x D	0.5 x D	160	0.025	0.040	0.055	0.070	0.080	0.110	0.130	0.170	
Steels	45-50	1 x D	0.2 x D	0.5 x D	120	0.020	0.030	0.045	0.055	0.070	0.090	0.110	0.140	
Steels	50-55	1 x D	0.2 x D	0.5 x D	80	0.015	0.020	0.030	0.040	0.045	0.060	0.075	0.090	
Steels	> 55	1 x D	0.2 x D	0.25 x D	70	0.010	0.015	0.020	0.030	0.035	0.050	0.060	0.070	

➔ Finishing

Material	Rockwell Hardness	Application			Vc-Cutting Speed m/min	fz- feed per tooth in mm D-Diameter in mm								
		Side Milling		Slotting		TiAlN	3	6	8	10	12	16	20	25
		ap	ae											
Steels	< 30	3.5 x D	0.1 x D	0.1 x D	200	0.040	0.055	0.070	0.090	0.110	0.150	0.180	0.200	
Steels	30-40	3.5 x D	0.1 x D	0.1 x D	180	0.030	0.050	0.060	0.085	0.100	0.140	0.170	0.190	
Steels	40-45	3.5 x D	0.1 x D	0.1 x D	160	0.025	0.040	0.055	0.070	0.080	0.110	0.130	0.170	
Steels	45-50	3.5 x D	0.1 x D	0.1 x D	120	0.020	0.030	0.045	0.055	0.070	0.090	0.110	0.140	
Steels	50-55	3.5 x D	0.1 x D	0.1 x D	80	0.015	0.020	0.030	0.040	0.045	0.060	0.075	0.090	
Steels	> 55	3.5 x D	0.1 x D	0.1 x D	70	0.010	0.015	0.020	0.030	0.035	0.050	0.060	0.070	

## RECOMMENDED WORKING DETAILS

### LISTS 7545 / 7595 |

→ **Roughing**

Material	Rockwell Hardness	Application			Vc-Cutting Speed m/min	fz-feed per tooth in mm D-Diameter in mm							
		Side Milling		Slotting									
		ap	ae	ap		TiAlN	3	6	8	10	12	16	20
Steels	<30	1 x D	0.4 x D	1 x D	200	0.040	0.055	0.070	0.090	0.110	0.150	0.180	0.200
Steels	30-40	1 x D	0.4 x D	0.75 x D	180	0.030	0.050	0.060	0.085	0.100	0.140	0.170	0.190
Steels	40-45	1 x D	0.4 x D	0.75 x D	160	0.025	0.040	0.055	0.070	0.080	0.110	0.130	0.170
Steels	45-50	0.8 x D	2.5 x D	0.5 x D	120	0.020	0.030	0.045	0.055	0.070	0.090	0.110	0.140
Steels	50-55	0.75 x D	2.5 x D	0.5 x D	80	0.015	0.020	0.030	0.040	0.045	0.060	0.075	0.090
Steels	>55	0.75 x D	2.5 x D	0.4 x D	70	0.010	0.015	0.020	0.030	0.035	0.050	0.060	0.070

→ **Finishing**

Material	Rockwell Hardness	Application			Vc-Cutting Speed m/min	fz-feed per tooth in mm D-Diameter in mm							
		Side Milling		Slotting									
		ap	ae	ap		TiAlN	3	6	8	10	12	16	20
Steels	<30	1.5 x D	0.1 x D	1 x D	200	0.040	0.055	0.070	0.090	0.110	0.150	0.180	0.200
Steels	30-40	1.5 x D	0.1 x D	1 x D	180	0.030	0.050	0.060	0.085	0.100	0.140	0.170	0.190
Steels	40-45	1.5 x D	0.1 x D	1 x D	160	0.025	0.040	0.055	0.070	0.080	0.110	0.130	0.170
Steels	45-50	1.5 x D	0.1 x D	1 x D	120	0.020	0.030	0.045	0.055	0.070	0.090	0.110	0.140
Steels	50-55	1.5 x D	0.1 x D	1 x D	80	0.015	0.020	0.030	0.040	0.045	0.060	0.075	0.090
Steels	>55	1.5 x D	0.1 x D	1 x D	70	0.010	0.015	0.020	0.030	0.035	0.050	0.060	0.070

### LIST 7670 |

Material	Rockwell Hardness	Application			Vc-Cutting Speed m/min	fz-feed per tooth in mm D-Diameter in mm									
		Side Milling		Slotting											
		ap	ae	ap		TiAlN	4	5	6	8	10	12	16	20	25
Steels	<30	0.8 x D	0.5 x D	0.8 x D	180	0.020	0.025	0.030	0.040	0.050	0.060	0.080	0.100	0.120	
Steels	30-40	0.8 x D	0.4 x D	0.8 x D	120	0.015	0.020	0.025	0.030	0.040	0.045	0.060	0.080	0.100	
Steels	40-50	0.8 x D	0.4 x D	0.5 x D	80	0.010	0.015	0.020	0.025	0.030	0.040	0.050	0.060	0.070	
Steels	50-60	0.8 x D	0.25 x D	0.3 x D	60	0.007	0.008	0.010	0.015	0.020	0.025	0.030	0.040	0.045	
Steels	60-70	0.8 x D	0.2 x D	0.25 x D	40	0.006	0.007	0.010	0.010	0.015	0.020	0.025	0.030	0.035	

For slotting: multiply by 0.8 the feed per tooth (fz) in the table.

### LIST 7N01 |

Material	Rockwell Hardness	Application			Vc-Cutting Speed m/min	fz- Feed Per Tooth in mm D- Diameter in mm									
		Side milling		Slotting											
		ae	ap	ap		TiAlN	0,3	0,4	0,5	0,6	0,8	1	1,5	2	3
Steel	~30	0.2xD	0.05xD	~0.1xD	40~150	0.0075	0.0088	0.010	0.011	0.013	0.015	0.022	0.030	0.032	
Steel	30~40	0.2xD	0.05xD	~0.1xD	40~120	0.0070	0.0080	0.009	0.010	0.012	0.013	0.020	0.025	0.030	
Steel	40~55	0.2xD	0.05xD	~0.1xD	40~100	0.0035	0.0047	0.006	0.007	0.010	0.012	0.015	0.020	0.025	
Steel	55~60	0.2xD	0.05xD	~0.1xD	40~60	0.0020	0.0035	0.005	0.006	0.008	0.010	0.014	0.018	0.022	

if D<1.0mm ap= 0.05D  
D>1.0mm ap= 0.1D  
>45HRC ap= 0.05D

### LISTS 7N02 / 7N12 / 7N22 |

Material	Rockwell Hardness	Application			Vc-Cutting Speed m/min	fz- Feed Per Tooth in mm D- Diameter in mm									
		Side milling		Slotting											
		ae	ap	ap		TiAlN	0,3	0,4	0,5	0,6	0,8	1	1,5	2	3
Steel	~30	0.2xD	0.5xD-D	0.1xD	40~80	0.0026	0.0035	0.0045	0.0050	0.007	0.008	0.013	0.018	0.023	
Steel	30~40	0.2xD	0.5xD-D	0.1xD	40~70	0.0020	0.0030	0.0037	0.0047	0.006	0.007	0.012	0.015	0.020	
Steel	40~55	0.2xD	0.5xD-D	0.02xD	30~50	0.0014	0.0019	0.0025	0.0029	0.035	0.045	0.007	0.009	0.010	
Steel	55~60	0.2xD	0.5xD-D	0.01xD	15~30	0.0011	0.0014	0.0017	0.0019	0.0025	0.003	0.005	0.0068	0.0082	

if D<1.0mm ap= 0.1D  
D>1.0mm ap= 0.3D

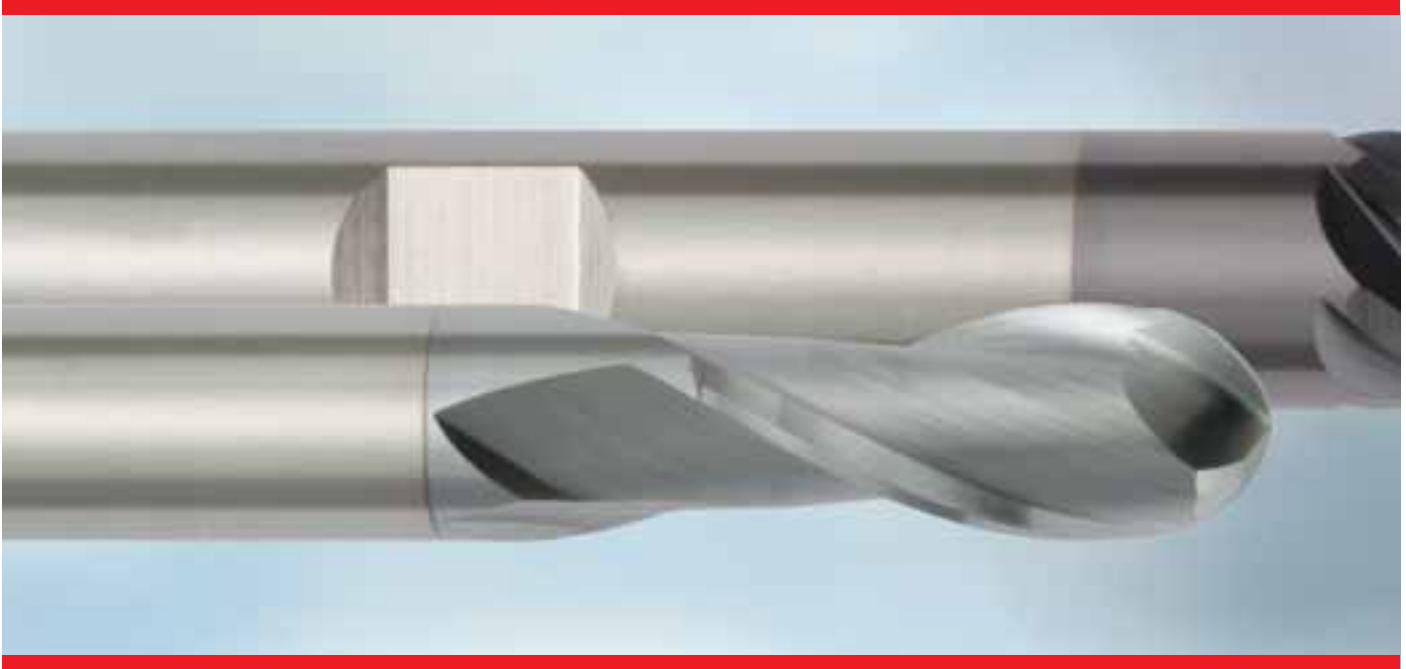
For list 7N22 reduce cutting speed and feed by 20~30%

**NOTE**

Data shown is the result of actual machining tests and is suggested as a starting point. Do sensitivity analyses to achieve optimum results. The tests were run on an optimal machining environment.

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## → CARBIDE FINISHERS |



Hanita's wide range of carbide finishing end mills, ranging from conventional geometries for general machining situations or ultra high performance styles for very specific applications, provides the right tool for the job at hand.

Only the finest carbide substrate materials, with the proper microstructure are used, to assure appropriate hardness, toughness and stability, combined with focused geometries, fully compliant with DIN, JIS, or NAS specifications, targeted at delivering superior productivity for the applications they were meant to serve and our high quality, in-house PVD coatings.

Hanita carbide end mills deliver superior performance, reliably and consistently, from tool to tool.

- Available as standard in 2, 3, 4 and 6 flute styles.
- special designs with higher # of flutes for super finishing applications.
- many helix choices for specific applications.
- stub, regular, long and extra lengths.
- TiN, TiCN and TiAlN Coatings.
- Specific geometries targeted for Aluminium, Stainless Steel, High Temperature Alloys , Titanium, Soft, Hardened and Ultra Hard Steels.



## Description

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CARBIDE  
FINISHERS



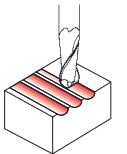
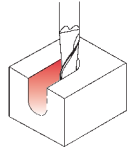
# → CARBIDE FINISHERS |

## 2 FLUTES BALL NOSE LISTS 4001 / 4011 / 4021

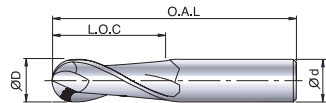
for 3D Milling and Deep Slotting



\*only for List 4001



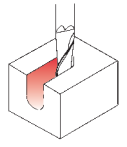
D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
1	3	4	38	2	400101000
1.5	3	5	38	2	400101500
2	3	6.3	38	2	400102000
3	3	9.5	38	2	400103002
3	3	25	75	2	402103000
4	4	12	50	2	400104002
4	4	19	63	2	401104001
4	4	31	75	2	402104001
5	6	14	50	2	400105002
5	5	20	63	2	401105001
5	5	31	100	2	402105001
6	6	16	50	2	400106002
6	6	28	76	2	401106002
6	6	38	100	2	402106002
8	8	20	63	2	400108003
8	8	28	76	2	401108003
8	8	41	100	2	402108003
10	10	22	76	2	400110004
10	10	32	89	2	401110004
10	10	45	100	2	402110004
12	12	25	76	2	400112005
12	12	45	100	2	401112005
12	12	75	150	2	402112005
14	14	32	83	2	400114014
14	14	50	100	2	401114014
14	14	75	150	2	402114014
16	16	32	89	2	400116006
16	16	56	110	2	401116006
16	16	75	150	2	402116006
18	18	38	100	2	400118007
18	18	75	150	2	402118018
20	20	38	104	2	400120007
20	20	56	125	2	401120007
20	20	75	150	2	402120007



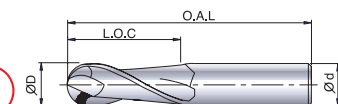
Weldon Shank upon request

## 2 FLUTES BALL NOSE | LONG SHANK LIST 4001 JJ

for Deep 3D Milling



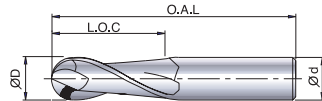
D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	9.5	58	2	400103002
4	6	12	76	2	400104002
5	6	14	76	2	400105002
6	6	16	100	2	400106002
8	8	20	100	2	400108003
10	10	22	100	2	400110004
12	12	25	125	2	400112005
14	14	32	125	2	400114005
16	16	32	150	2	400116006
18	16	38	150	2	400118006
20	20	38	150	2	400120007



for 3D Milling

## 2 FLUTES BALL NOSE | MICRO LIST 4651

D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
1	3	2	38	2	465101000
1.2	3	2	38	2	465101200
1.5	3	2	38	2	465101500
1.8	3	2	38	2	465101800
2	3	2	38	2	465102000



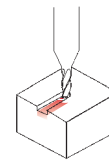
CARBIDE 30°

HANITA Standard

Uncoated \*\*

TiCN CT

TiAlN RT



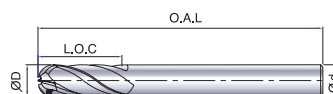
GENERAL PURPOSE



for 3D Milling

## 4 FLUTES BALL NOSE LISTS 4000 / 4010

D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
3	3	9.5	38	4	400003002
4	4	12	50	4	400004002
4	4	19	63	4	401004001
5	6	14	50	4	400005002
5	5	20	63	4	401005001
6	6	16	50	4	400006002
6	6	28	76	4	401006002
8	8	20	63	4	400008003
8	8	28	76	4	401008003
10	10	22	76	4	400010004
10	10	32	89	4	401010004
12	12	25	76	4	400012005
12	12	45	100	4	401012005
14	14	32	83	4	400014014
14	14	50	100	4	401014014
16	16	32	89	4	400016006
16	16	56	110	4	401016006
18	18	38	100	4	400018007
20	20	38	104	4	400020007
20	20	56	125	4	401020007



CARBIDE 30°

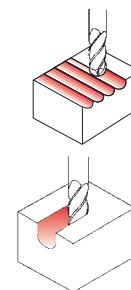
HANITA Standard

Uncoated \*\*

TiN TT

TiCN CT

TiAlN RT



ST>45 HRc

30<ST<45 HRc

30<ST HRc

GENERAL PURPOSE

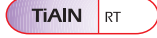
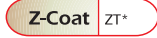


CARBIDE  
FINISHERS

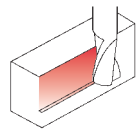
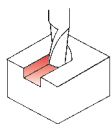
# → CARBIDE FINISHERS I

## 2 FLUTES SQUARE END LISTS 4002 / 4012 / 4022

for Slotting

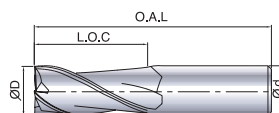


\* only for list 4002



D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
1	3	4	38	2	400201000
1.5	3	4	38	2	400201500
2	3	6.3	38	2	400202000
2.5	3	6.3	38	2	400202500
3	3	9.5	38	2	400203000
3	3	19	63	2	401203000
3	3	25	75	2	402203000
3.5	4	12	50	2	400203501
4	4	12	50	2	400204001
4	4	19	63	2	401204001
4	4	31	75	2	402204001
4.5	6	14	50	2	400204502
5	6	14	50	2	400205002
5	5	20	63	2	401205001
5	5	31	100	2	402205001
5.5	6	14	50	2	400205502
6	6	16	50	2	400206002
6	6	28	76	2	401206002
6	6	38	100	2	402206002
7	7	20	63	2	400207003
8	8	20	63	2	400208003
8	8	28	76	2	401208003
8	8	41	100	2	402208003
9	9	20	63	2	400209004
10	10	22	76	2	400210004
10	10	32	89	2	401210004
10	10	45	100	2	402210004
11	11	25	76	2	400211005
12	12	25	76	2	400212005
12	12	45	100	2	401212005
12	12	75	150	2	402212005
14	14	32	83	2	400214014
14	14	50	100	2	401214014
14	14	75	150	2	402214014
16	16	32	89	2	400216006
16	16	56	110	2	401216006
16	16	75	150	2	402216006
18	18	38	100	2	400218007
18	18	60	125	2	401218018
18	18	75	150	2	402218018
20	20	38	104	2	400220007
20	20	56	125	2	401220007
20	20	75	150	2	402220007
25	25	62	140	2	401225008

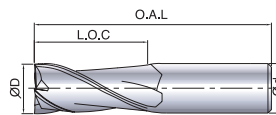
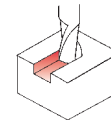
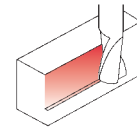
Weldon Shank upon request



for Slotting Aluminium

**2 FLUTES SQUARE END | HIGH HELIX  
LIST 4102**

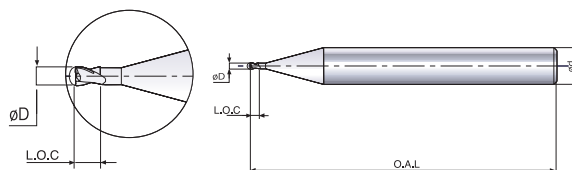
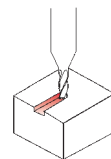
D(h6)	d	L.O.C	O.A.L	Z	ITEM No.
1.5	3	6	38	2	410201500
2	3	8	38	2	410202000
2.5	3	9	38	2	410202500
3	3	12	38	2	410203000
4	4	12	50	2	410204001
5	5	14	50	2	410205001
5	6	14	50	2	410205002
6	6	16	50	2	410206002
8	8	20	63	2	410208003
10	10	22	76	2	410210004
12	12	25	76	2	410212005
14	14	32	83	2	410214014
16	16	32	89	2	410216006
18	18	38	100	2	410218018
20	20	38	104	2	410220007



for Slotting and Side Milling

**2 FLUTES SQUARE END | MICRO  
LIST 4632**

D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
0.4	3	1.5	38	2	463200400
0.5	3	1.5	38	2	463200500
0.6	3	1.5	38	2	463200600
0.8	3	1.5	38	2	463200800
1	3	2	38	2	463201000
1.5	3	2	38	2	463201500

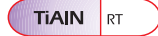
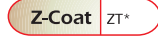


CARBIDE  
FINISHERS

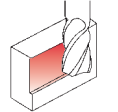
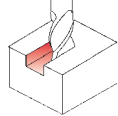
# → CARBIDE FINISHERS I

## 3 FLUTES SQUARE END LISTS 4003 / 4013

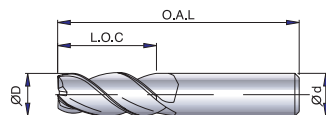
for Slotting and Side Milling



\* only for list 4003



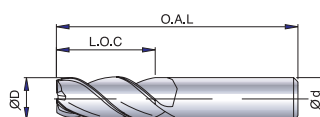
D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
1	3	4	38	3	400301000
1.5	3	4	38	3	400301500
2	3	6.3	38	3	400302000
2.5	3	6.3	38	3	400302500
3	3	9.5	38	3	400303000
3	3	19	63	3	401303000
3.5	4	12	50	3	400303501
4	4	12	50	3	400304001
4	4	19	63	3	401304001
4.5	6	14	50	3	400304502
5	6	14	50	3	400305002
5	5	20	63	3	401305001
6	6	16	50	3	400306002
6	6	28	76	3	401306002
7	7	20	63	3	400307003
8	8	20	63	3	400308003
8	8	28	76	3	401308003
9	9	20	63	3	400309004
10	10	22	76	3	400310004
10	10	32	89	3	401310004
11	11	25	76	3	400311005
12	12	25	76	3	400312005
12	12	45	100	3	401312005
14	14	32	83	3	400314014
16	16	32	89	3	400316006
16	16	56	110	3	401316006
18	18	38	100	3	400318007
20	20	38	104	3	400320007
20	20	56	125	3	401320007
25	25	62	140	3	401325008



for Slotting and Side Milling Aluminium

### 3 FLUTES SQUARE END | HIGH HELIX LIST 4103

D(h6)	d	L.O.C	O.A.L	Z	ITEM No.
3	3	12	38	3	410303000
4	4	12	50	3	410304001
5	5	14	50	3	410305001
6	6	16	50	3	410306002
8	8	20	63	3	410308003
10	10	22	76	3	410310004
12	12	25	76	3	410312005
14	14	32	83	3	410314014
16	16	32	89	3	410316006
18	18	38	100	3	410318018
20	20	38	104	3	410320007

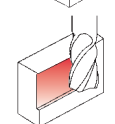
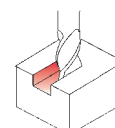


CARBIDE 45°

HANITA Standard

Uncoated \*\*

TiCN CT



NF

Al

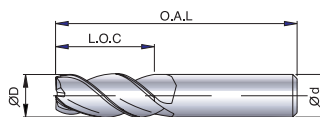
AlSi



for Deep Slotting and Peripheral  
Finishing Operation

### 3 FLUTES SQUARE END | HIGH HELIX | LONG SHANK LIST 4503 JJ

D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
1	4	3	50	3	450301001
1.5	4	3	50	3	450301501
2	4	3	50	3	450302001
2.5	4	4	50	3	450302501
2.5	4	5	50	3	450302511
3	6	8	50	3	450303002
3.5	6	12	50	3	450303502
4	6	12	50	3	450304002
4.5	6	14	50	3	450304502
5	6	14	50	3	450305002
6	6	16	50	3	450306002
8	8	20	63	3	450308003
10	10	22	76	3	450310004
12	12	25	76	3	450312005
16	16	32	89	3	450316006
20	20	38	104	3	450320007



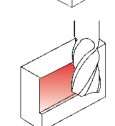
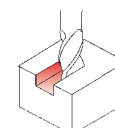
CARBIDE 45°

JIS Standard

Uncoated JJ

TiCN CJ

TiAlN RJ



St S

Ti

INCONEL

30-ST<45 HRc

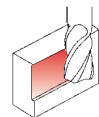


CARBIDE  
FINISHERS

# → CARBIDE FINISHERS |

## 3 FLUTES SQUARE END | HIGH HELIX LIST 4603

for Peripheral Finishing Operation

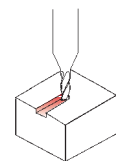


D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	8	57	3	460303002
4	6	11	57	3	460304002
5	6	13	57	3	460305002
6	6	13	57	3	460306002
8	8	19	63	3	460308003
10	10	22	72	3	460310004
12	12	26	83	3	460312005
16	16	32	92	3	460316006
20	20	38	104	3	460320007

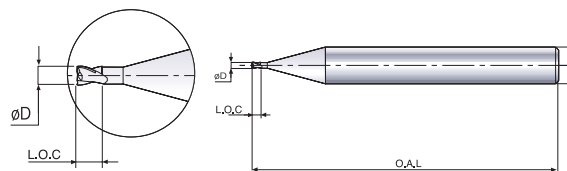


## 3 FLUTES SQUARE END | MICRO LIST 4633

for Slotting and Side Milling



D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
0.4	3	1.5	38	3	463300400
0.5	3	1.5	38	3	463300500
0.6	3	1.5	38	3	463300600
0.8	3	1.5	38	3	463300800
1	3	2	38	3	463301000
1.2	3	2	38	3	463301200
1.5	3	2	38	3	463301500
1.8	3	2	38	3	463301800

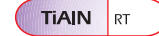


for Peripheral Finishing Operation

## 4 FLUTES SQUARE END LISTS 4004 / 4014 / 4024

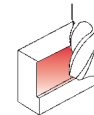
D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
1	3	4	38	4	400401000
1.5	3	4	38	4	400401500
2	3	6.3	38	4	400402000
2.5	3	6.3	38	4	400402500
3	3	9.5	38	4	400403000
3	3	19	63	4	401403000
3	3	25	75	4	402403000
3.5	4	12	50	4	400403501
4	4	12	50	4	400404001
4	4	19	63	4	401404001
4	4	31	75	4	402404001
4.5	6	14	50	4	400404502
5	5	14	50	4	400405001
5	6	14	50	4	400405002
5	5	20	63	4	401405001
5	5	31	100	4	402405001
5.5	6	14	50	4	400405502
6	6	16	50	4	400406002
6	6	28	76	4	401406002
6	6	38	100	4	402406002
7	7	20	63	4	400407003
8	8	20	63	4	400408003
8	8	28	76	4	401408003
8	8	41	100	4	402408003
9	9	20	63	4	400409004
10	10	22	76	4	400410004
10	10	32	89	4	401410004
10	10	45	100	4	402410004
11	11	25	76	4	400411005
12	12	25	76	4	400412005
12	12	45	100	4	401412005
12	12	75	150	4	402412005
14	14	32	83	4	400414014
14	14	50	100	4	401414014
14	14	75	150	4	402414014
16	16	32	89	4	400416006
16	16	56	110	4	401416006
16	16	75	150	4	402416006
18	18	38	100	4	400418007
18	18	60	125	4	401418018
18	18	75	150	4	402418018
20	20	38	104	4	400420007
20	20	56	125	4	401420007
20	20	75	150	4	402420007
25	25	62	140	4	401425008

Weldon Shank upon request

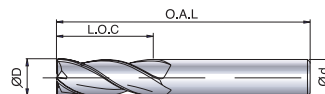


\* only for list 4004

\*\* only for lists 4004/14



CARBIDE  
FINISHERS



# → CARBIDE FINISHERS I

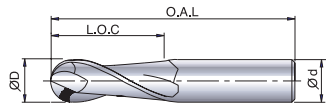
## 2 FLUTES BALL NOSE LISTS D001 / D011

for 3D Milling



- CARBIDE
- 30°
- DIN 6527 Standard
- Uncoated WW
- TiCN CW
- TiAlN RW
- 
- ST > 45 HRC
- 30 < ST < 45 HRC
- 30 > ST HRC
- GRAPHITE
- GENERAL PURPOSE

D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	4	50	2	D00103002
3	6	7	57	2	D01103002
4	6	5	54	2	D00104002
4	6	8	57	2	D01104002
5	6	6	54	2	D00105002
5	6	10	57	2	D01105002
6	6	7	54	2	D00106002
6	6	10	57	2	D01106002
8	8	9	58	2	D00108003
8	8	16	63	2	D01108003
10	10	11	66	2	D00110004
10	10	19	72	2	D01110004
12	12	12	73	2	D00112005
12	12	22	83	2	D01112005
14	14	14	75	2	D00114014
14	14	22	83	2	D01114014
16	16	16	82	2	D00116006
16	16	26	92	2	D01116006
18	18	18	84	2	D00118018
18	18	26	92	2	D01118018
20	20	20	92	2	D00120007
20	20	32	104	2	D01120007



## 2 FLUTES BALL NOSE LIST D501

for 3D Milling at High Speed  
Machining



- CARBIDE
- 30°
- DIN 6527 Standard
- Uncoated \*\*
- TiAlN RT
- 
- ST > 45 HRC
- 30 < ST < 45 HRC
- GRAPHITE
- AI

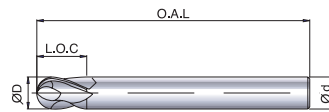
D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
2	6	4	50	2	D50102002
3	6	4	50	2	D50103002
4	6	5	54	2	D50104002
5	6	6	54	2	D50105002
6	6	7	54	2	D50106002
8	8	9	58	2	D50108003
10	10	11	66	2	D50110004
12	12	12	73	2	D50112005
14	14	14	75	2	D50114014
16	16	16	82	2	D50116006
18	18	18	84	2	D50118018
20	20	20	92	2	D50120007



for Deep 3D Milling

**3 FLUTES BALL NOSE | LONG TYPE  
LIST D009**

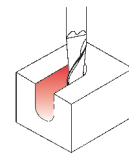
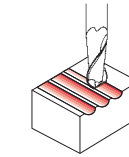
D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	7	57	3	D00903002
4	6	8	57	3	D00904002
5	6	10	57	3	D00905002
6	6	10	57	3	D00906002
8	8	16	63	3	D00908003
10	10	19	72	3	D00910004
12	12	22	83	3	D00912005
14	14	22	83	3	D00914014
16	16	26	92	3	D00916006
18	18	26	92	3	D00918018
20	20	32	104	3	D00920007



CARBIDE 30°

DIN 6527 Standard

TiAIN RW



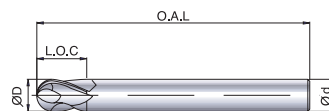
GENERAL PURPOSE



for 3D Milling

**3 FLUTES BALL NOSE | LONG TYPE  
LIST DC19**

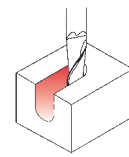
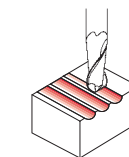
D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	7	57	3	DC1903002
4	6	8	57	3	DC1904002
5	6	10	57	3	DC1905002
6	6	10	57	3	DC1906002
8	8	16	63	3	DC1908003
10	10	19	72	3	DC1910004
12	12	22	83	3	DC1912005
14	14	22	83	3	DC1914014
16	16	26	92	3	DC1916006
18	18	26	92	3	DC1918018
20	20	32	104	3	DC1920007



CARBIDE 35°

DIN 6527 Standard

TiAIN LW



Al

AlSi

30>ST HRc St S

GRAPHITE NF

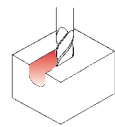
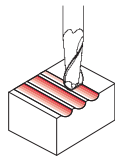


CARBIDE  
FINISHERS

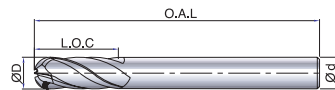
# → CARBIDE FINISHERS I

## 4 FLUTES BALL NOSE LISTS D000 / D010

for 3D Milling



D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	5	50	4	D00003002
3	6	8	57	4	D01003002
4	6	8	54	4	D00004002
4	6	11	57	4	D01004002
5	6	9	54	4	D00005002
5	6	13	57	4	D01005002
6	6	10	54	4	D00006002
6	6	13	57	4	D01006002
8	8	12	58	4	D00008003
8	8	19	63	4	D01008003
10	10	14	66	4	D00010004
10	10	22	72	4	D01010004
12	12	16	73	4	D00012005
12	12	26	83	4	D01012005
14	14	18	75	4	D00014014
14	14	26	83	4	D01014014
16	16	22	82	4	D00016006
16	16	32	92	4	D01016006
18	18	24	84	4	D00018018
18	18	32	92	4	D01018018
20	20	26	92	4	D00020007
20	20	38	104	4	D01020007



for Deep Slotting

## 2 FLUTES SQUARE END LISTS D002 / D012

D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
2	6	3	50	2	D00202002
2	6	6	53	2	D01202002
2.5	6	3	50	2	D00202502
2.5	6	6	53	2	D01202502
2.8	6	7	57	2	D01202802
3	6	4	50	2	D00203002
3	6	7	57	2	D01203002
3.5	6	7	57	2	D01203502
3.8	6	8	57	2	D01203802
4	6	5	54	2	D00204002
4	6	8	57	2	D01204002
4.5	6	8	57	2	D01204502
4.8	6	10	57	2	D01204802
5	6	6	54	2	D00205002
5	6	10	57	2	D01205002
5.5	6	10	57	2	D01205502
5.75	6	10	57	2	D01205752
6	6	7	54	2	D00206002
6	6	10	57	2	D01206002
6.5	8	13	63	2	D01206503
6.75	8	13	63	2	D01206753
7	8	8	58	2	D00207003
7	8	13	63	2	D01207003
7.75	8	16	63	2	D01207753
8	8	9	58	2	D00208003
8	8	16	63	2	D01208003
8.7	10	16	72	2	D01208704
9	10	10	66	2	D00209004
9	10	16	72	2	D01209004
9.7	10	19	72	2	D01209704
10	10	11	66	2	D00210004
10	10	19	72	2	D01210004
11.7	12	22	83	2	D01211705
12	12	12	73	2	D00212005
12	12	22	83	2	D01212005
14	14	14	75	2	D00214014
14	14	22	83	2	D01214014
16	16	16	82	2	D00216006
16	16	26	92	2	D01216006
18	18	18	84	2	D00218018
18	18	26	92	2	D01218018
20	20	20	92	2	D00220007
20	20	32	104	2	D01220007

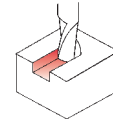
CARBIDE 

DIN 6527 Standard 

Uncoated WW

TiCN CW

TiAlN RW



ST>45 HRC

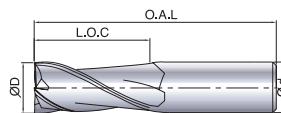
30<ST<45 HRC

30<ST HRC

GRAPHITE

GENERAL PURPOSE

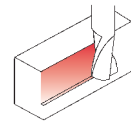
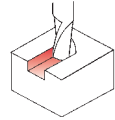
CARBIDE  
FINISHERS



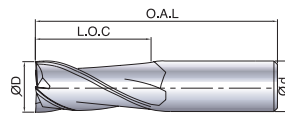
# → CARBIDE FINISHERS I

## 2 FLUTES SQUARE END LIST D502

for Slotting and Side Milling  
at High Speed Machining



D(h6)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	4	50	2	<b>D50203002</b>
4	6	5	54	2	<b>D50204002</b>
5	6	6	54	2	<b>D50205002</b>
6	6	7	54	2	<b>D50206002</b>
8	8	9	58	2	<b>D50208003</b>
10	10	11	66	2	<b>D50210004</b>
12	12	12	73	2	<b>D50212005</b>
14	14	14	75	2	<b>D50214014</b>
16	16	16	82	2	<b>D50216006</b>
18	18	18	84	2	<b>D50218018</b>
20	20	20	92	2	<b>D50220007</b>



for Slotting and Side Milling

### 3 FLUTES SQUARE END LISTS D003 / D013

D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
2	6	3	50	3	D00302002
2	6	6	53	3	D01302002
2.5	6	3	50	3	D00302502
2.5	6	6	53	3	D01302502
3	6	4	50	3	D00303002
3	6	7	57	3	D01303002
3.5	6	4	50	3	D00303502
3.5	6	7	57	3	D01303502
4	6	5	54	3	D00304002
4	6	8	57	3	D01304002
4.5	6	5	54	3	D00304502
4.5	6	8	57	3	D01304502
5	6	6	54	3	D00305002
5	6	10	57	3	D01305002
5.5	6	7	54	3	D00305502
5.5	6	10	57	3	D01305502
6	6	7	54	3	D00306002
6	6	10	57	3	D01306002
6.5	8	13	63	3	D01306503
7	8	8	58	3	D00307003
7	8	13	63	3	D01307003
8	8	9	58	3	D00308003
8	8	16	63	3	D01308003
9	10	10	66	3	D00309004
9	10	16	72	3	D01309004
10	10	11	66	3	D00310004
10	10	19	72	3	D01310004
12	12	12	73	3	D00312005
12	12	22	83	3	D01312005
14	14	14	75	3	D00314014
14	14	22	83	3	D01314014
16	16	16	82	3	D00316006
16	16	26	92	3	D01316006
18	18	18	84	3	D00318018
18	18	26	92	3	D01318018
20	20	20	92	3	D00320007
20	20	32	104	3	D01320007

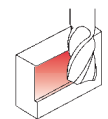
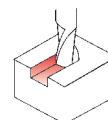
CARBIDE 30°

DIN 6527 Standard

Uncoated WW

TiCN CW

TiAlN RW



ST>45 HRC

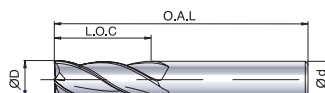
30<ST<45 HRC

30>ST HRC

GRAPHITE

GENERAL PURPOSE

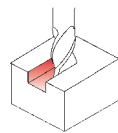
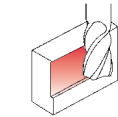
CARBIDE  
FINISHERS



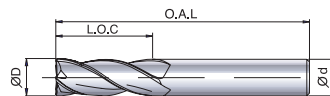
# → CARBIDE FINISHERS |

## 3 FLUTES SQUARE END | HIGH HELIX | LONG SHANK LISTS D503 / D513

for Deep Slotting and Peripheral  
Finishing Operations

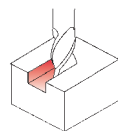
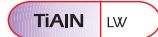


D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
2	6	3	50	3	D50302002
3	6	4	50	3	D50303002
3	6	7	57	3	D51303002
4	6	5	54	3	D50304002
4	6	8	57	3	D51304002
5	6	6	54	3	D50305002
5	6	10	57	3	D51305002
6	6	7	54	3	D50306002
6	6	10	57	3	D51306002
8	8	9	58	3	D50308003
8	8	16	63	3	D51308003
10	10	11	66	3	D50310004
10	10	19	72	3	D51310004
12	12	12	73	3	D50312005
12	12	22	83	3	D51312005
14	14	14	75	3	D50314014
14	14	22	83	3	D51314014
16	16	16	82	3	D50316006
16	16	26	92	3	D51316006
18	18	18	84	3	D50318018
18	18	26	92	3	D51318018
20	20	20	92	3	D50320007
20	20	32	104	3	D51320007

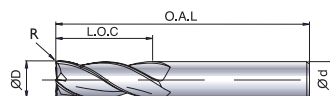


## 3 FLUTES SQUARE END | CORNER RADII LIST DC03

for Slotting and Finishing  
Stainless Steel and Aluminium



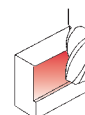
D(e8)	d	L.O.C	O.A.L	R	Z	ITEM No.
3	6	4	50	0.25	3	DC0303002
4	6	5	54	0.25	3	DC0304002
5	6	6	54	0.25	3	DC0305002
6	6	7	54	0.45	3	DC0306002
8	8	9	58	0.45	3	DC0308003
10	10	11	66	0.45	3	DC0310004
12	12	12	73	0.45	3	DC0312005
14	14	14	75	0.45	3	DC0314014
16	16	16	82	0.45	3	DC0316006
18	18	18	84	0.45	3	DC0318018
20	20	20	92	0.45	3	DC0320007



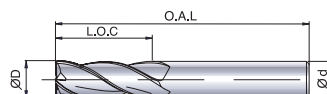
for Peripheral Finishing Operation

## 4 FLUTES SQUARE END LISTS D004 / D014

D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
2	6	4	50	4	D00402002
2	6	7	53	4	D01402002
2.5	6	4	50	4	D00402502
2.5	6	7	53	4	D01402502
3	6	5	50	4	D00403002
3	6	8	57	4	D01403002
3.5	6	6	50	4	D00403502
3.5	6	10	57	4	D01403502
4	6	8	54	4	D00404002
4	6	11	57	4	D01404002
4.5	6	8	54	4	D00404502
4.5	6	11	57	4	D01404502
5	6	9	54	4	D00405002
5	6	13	57	4	D01405002
5.5	6	10	54	4	D00405502
5.5	6	13	57	4	D01405502
6	6	10	54	4	D00406002
6	6	13	57	4	D01406002
6.5	8	16	63	4	D01406503
7	8	11	58	4	D00407003
7	8	16	63	4	D01407003
8	8	12	58	4	D00408003
8	8	19	63	4	D01408003
9	10	13	66	4	D00409004
9	10	19	72	4	D01409004
10	10	14	66	4	D00410004
10	10	22	72	4	D01410004
12	12	16	73	4	D00412005
12	12	26	83	4	D01412005
14	14	18	75	4	D00414014
14	14	26	83	4	D01414014
16	16	22	82	4	D00416006
16	16	32	92	4	D01416006
18	18	24	84	4	D00418018
18	18	32	92	4	D01418018
20	20	26	92	4	D00420007
20	20	38	104	4	D01420007
25	25	45	121	4	D01425008



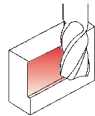
CARBIDE  
FINISHERS



# → CARBIDE FINISHERS |

## 6 FLUTES SQUARE END | HIGH HELIX LISTS D507 / D517

for Peripheral Finishing Operation

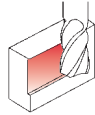


D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
6	6	10	54	6	D50706002
6	6	13	57	6	D51706002
8	8	12	58	6	D50708003
8	8	19	63	6	D51708003
10	10	14	66	6	D50710004
10	10	22	72	6	D51710004
12	12	16	73	6	D50712005
12	12	26	83	6	D51712005
14	14	18	75	6	D50714014
14	14	26	83	6	D51714014
16	16	22	82	6	D50716006
16	16	32	92	6	D51716006
18	18	24	84	6	D50718018
18	18	32	92	6	D51718018
20	20	26	92	6	D50720007
20	20	38	104	6	D51720007



## MULTI-FLUTES SQUARE END | HIGH HELIX LIST D518

for Peripheral High Accuracy  
Finishing Operation



D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
4	6	11	57	4	D51804002
5	6	13	57	4	D51805002
6	6	13	57	6	D51806002
7	8	16	63	6	D51807003
8	8	19	63	6	D51808003
9	10	19	72	6	D51809004
10	10	22	72	6	D51810004
12	12	26	83	6	D51812005
14	14	26	83	6	D51814014
16	16	32	92	8	D51816006
18	18	32	92	8	D51818018
20	20	38	104	8	D51820007
25	25	45	121	8	D51825008



for Peripheral High Accuracy  
Long Milling of Ultra-Hard Steels

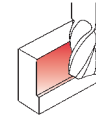
**MULTI FLUTES SQUARE END | HIGH HELIX  
LIST D618**

D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
3	4	8	50	4	<b>D61803002</b>
4	6	12	57	4	<b>D61804002</b>
5	6	13	57	4	<b>D61805002</b>
6	6	15	60	6	<b>D61806002</b>
7	8	20	75	6	<b>D61807003</b>
8	8	20	75	6	<b>D61808003</b>
10	10	25	80	6	<b>D61810004</b>
12	12	30	100	6	<b>D61812005</b>
16	16	40	110	6	<b>D61816006</b>
20	20	45	120	6	<b>D61820007</b>

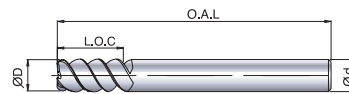
PREMIUM CARBIDE 50°

JIS Standard

TiAlN RJ



ST>45 HRC



CARBIDE  
FINISHERS

# ➔ CARBIDE FINISHERS I

## RECOMMENDED WORKING DETAILS

### FORMULAS

**Cutting Speed**

$$V_c = \frac{D \times \pi \times n}{1000} \text{ (m/min)}$$

**Spindle Speed**

$$n = \frac{V_c \times 1000}{\pi \times d} \text{ (1/min)}$$

**Feed per Tooth**

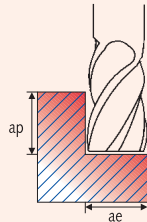
$$f_z = \frac{V_f}{z \times n} \text{ (mm)}$$

**Table Feed**

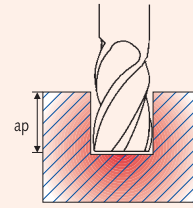
$$V_f = f_z \times z \times n \text{ (mm/min)}$$

**Formula Symbols:**

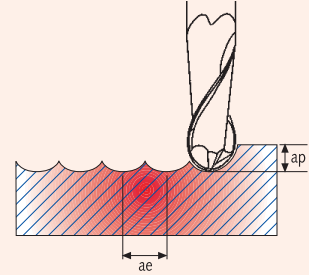
D (mm) Tool diameter  
 z No. of Flutes  
 V<sub>c</sub> (m/min) Cutting Speed  
 F<sub>z</sub> (mm) Feed per Tooth  
 n (1/min) Spindle Speed  
 V<sub>f</sub> (mm/min) Table Feed  
 π 3.1416



SIDE MILLING



SLOTING



PROFILING

## LISTS 4001 / 4011 / 4021 / JJ I

Material	Rockwell Hardness HRC	Application			Vc-Cutting Speed				fz-feed per tooth in mm D - diameter in mm						
		Side Milling		Slotting	m/min	m/min	m/min	m/min	4	6	8	10	12	16	20
		ap	ae	ap											
Steels	<42	0.3xD	0.7xD		70	100	120	0.020	0.033	0.040	0.049	0.054	0.063	0.080	
Steels	42-48	0.3xD	0.7xD		60	80	100	0.019	0.031	0.037	0.046	0.050	0.059	0.074	
Steels	48-52	0.3xD	0.7xD		45	60	80	0.015	0.025	0.030	0.037	0.041	0.047	0.060	
Cast Iron <180 HB		0.3xD	0.7xD		100	140	160	0.030	0.050	0.060	0.074	0.081	0.095	0.120	
Cast Iron >180 HB		0.3xD	0.7xD		80	100	140	0.024	0.040	0.048	0.059	0.064	0.075	0.096	
Stainless Steels		0.3xD	0.7xD		60	80	100	0.022	0.037	0.045	0.055	0.060	0.070	0.089	
Titanium		0.3xD	0.7xD		60	80	100	0.021	0.034	0.042	0.051	0.056	0.065	0.083	

## LISTS 4000 / 4010 I

Material	Rockwell Hardness HRC	Application			Vc-Cutting Speed				fz-feed per tooth in mm D - diameter in mm						
		Side Milling		Slotting	m/min	m/min	m/min	m/min	4	6	8	10	12	16	20
		ap	ae	ap											
Steels	<42	0.3xD	0.7xD		70	85	100	120	0.015	0.025	0.030	0.037	0.040	0.047	0.060
Steels	42-48	0.3xD	0.7xD		60	70	80	100	0.014	0.024	0.028	0.035	0.038	0.044	0.056
Steels	48-52	0.3xD	0.7xD		45	50	60	80	0.010	0.016	0.020	0.024	0.026	0.031	0.039
Cast Iron <180 HB		0.3xD	0.7xD		100	120	140	160	0.030	0.050	0.060	0.074	0.080	0.094	0.12
Cast Iron >180 HB		0.3xD	0.7xD		80	85	100	140	0.024	0.040	0.048	0.059	0.064	0.075	0.096
Stainless Steels		0.3xD	0.7xD		60	70	80	100	0.014	0.024	0.028	0.035	0.038	0.044	0.056
Titanium		0.3xD	0.7xD		60	70	80	100	0.014	0.024	0.028	0.035	0.038	0.044	0.056

## LISTS 4002 / 4012 / 4022 I

Material	Rockwell Hardness HRC	Application			Vc-Cutting Speed				fz-feed per tooth in mm D - diameter in mm							
		Side Milling		Slotting	m/min	m/min	m/min	m/min	2	4	6	8	10	12	16	20
		ap	ae	ap												
Steels	<42			0.25xD	70	80	100	120	0.005	0.012	0.019	0.026	0.032	0.040	0.052	0.078
Steels	42-48			0.25xD	60	85	80	100	0.005	0.011	0.017	0.023	0.029	0.036	0.047	0.070
Steels	48-52			0.25xD	45	50	60	80	0.005	0.010	0.016	0.022	0.026	0.033	0.043	0.065
Cast Iron <180 HB				0.5xD	100	110	140	160	0.006	0.013	0.020	0.028	0.034	0.043	0.056	0.084
Cast Iron >180 HB				0.5xD	80	80	100	140	0.005	0.012	0.019	0.026	0.032	0.040	0.052	0.078
Stainless Steels				0.25xD	60	64	80	100	0.005	0.011	0.017	0.023	0.029	0.036	0.047	0.070
Titanium				0.25xD	60	64	80	100	0.005	0.011	0.017	0.023	0.029	0.036	0.047	0.070

## RECOMMENDED WORKING DETAILS

### LIST 4102 |

Material	Application			Vc-Cutting Speed	fz-feed per tooth in mm D - diameter in mm						
	Side Milling		Slotting	m/min							
	ap	ae	ap	Uncoated	3	6	8	10	12	16	20
Aluminium Alloys	1xD	0.5xD	1xD	250	0.013	0.037	0.046	0.071	0.095	0.100	0.110
Aluminium High Silicon	1xD	0.5xD	1xD	180	0.011	0.027	0.034	0.052	0.070	0.108	0.100

### LISTS 4003 / 4013 |

Material	Rockwell Hardness	Application			Vc-Cutting Speed				fz-feed per tooth in mm D - diameter in mm							
		Side Milling		Slotting	m/min	m/min	m/min	m/min								
	HRc	ap	ae	ap	Uncoated	TiN	TiCN	TiAlN	2	4	6	8	10	12	16	20
Steels	<42	1xD	0.1xD	0.25xD	70	80	100	120	0.003	0.006	0.010	0.014	0.017	0.021	0.028	0.041
Steels	42-48	1xD	0.1xD	0.25xD	60	65	80	100	0.004	0.008	0.013	0.018	0.022	0.028	0.036	0.054
Steels	48-52	1xD	0.1xD		45	48	60	80	0.003	0.008	0.015	0.018	0.028	0.026	0.033	0.050
Cast Iron <180 HB		1xD	0.1xD		100	110	140	160	0.005	0.013	0.023	0.028	0.044	0.023	0.030	0.045
Cast Iron >180 HB		1xD	0.1xD		80	80	100	140	0.002	0.003	0.005	0.007	0.009	0.023	0.030	0.045
Stainless Steels		1xD	0.1xD		60	65	80	100	0.001	0.003	0.004	0.006	0.008	0.028	0.036	0.054
Titanium		1xD	0.1xD		60	65	80	100	0.001	0.002	0.004	0.005	0.006	0.028	0.036	0.054

### LIST 4103 |

Material	Application			Vc-Cutting Speed	fz-feed per tooth in mm D - diameter in mm						
	Side Milling		Slotting	m/min							
	ap	ae	ap	Uncoated	3	6	8	10	12	16	20
Aluminium Alloys	1xD	0.5xD	1xD	250	0.013	0.037	0.046	0.071	0.095	0.100	0.110
Aluminium High Silicon	1xD	0.5xD	1xD	180	0.011	0.027	0.034	0.052	0.070	0.108	0.100

### LIST 4503 JJ |

Material	Rockwell Hardness	Application			Vc-Cutting Speed			fz-feed per tooth in mm D - diameter in mm							
		Side Milling		Slotting	m/min	m/min	m/min								
	HRc	ap	ae	ap	Uncoated	TiCN	TiAlN	2	4	6	8	10	12	16	20
Steels	<42	1xD	0.1xD	0.25xD	70	100	120	0.003	0.006	0.010	0.014	0.017	0.021	0.028	0.041
Steels	42-48	1xD	0.1xD	0.25xD	60	80	100	0.004	0.008	0.013	0.018	0.022	0.028	0.036	0.054
Steels	48-52	1xD	0.1xD	0.25xD	45	60	80	0.003	0.008	0.012	0.017	0.021	0.026	0.033	0.050
Cast Iron <180 HB		1xD	0.1xD	0.5xD	100	140	160	0.003	0.007	0.011	0.015	0.018	0.023	0.030	0.045
Cast Iron >180 HB		1xD	0.1xD	0.5xD	80	100	140	0.003	0.007	0.011	0.015	0.018	0.023	0.030	0.045
Stainless Steels		1xD	0.1xD	0.25xD	60	80	100	0.004	0.008	0.010	0.018	0.022	0.028	0.036	0.054
Titanium		1xD	0.1xD	0.25xD	60	80	100	0.004	0.008	0.013	0.018	0.022	0.028	0.036	0.054

CARBIDE  
FINISHERS

# ➔ CARBIDE FINISHERS I

## RECOMMENDED WORKING DETAILS

### LISTS 4004 / 4014 / 4024 I

Material	Rockwell Hardness	Application			Vc-Cutting Speed				fz-feed per tooth in mm D - diameter in mm							
		Side Milling		Slotting	m/min	m/min	m/min	m/min	2	4	6	8	10	12	16	20
		ap	ae													
Steels	<42	1xD	0.1xD		70	85	100	120	0.006	0.015	0.026	0.032	0.050	0.065	0.100	0.130
Steels	42-48	1xD	0.1xD		60	70	80	100	0.005	0.013	0.022	0.027	0.043	0.055	0.085	0.111
Steels	48-52	1xD	0.1xD		45	50	60	80	0.004	0.011	0.018	0.022	0.035	0.046	0.070	0.091
Cast Iron <180 HB		1xD	0.1xD		100	120	140	160	0.007	0.017	0.029	0.035	0.055	0.072	0.110	0.143
Cast Iron >180 HB		1xD	0.1xD		80	85	100	140	0.002	0.004	0.007	0.009	0.011	0.014	0.018	0.027
Stainless Steels		1xD	0.1xD		60	70	80	100	0.002	0.004	0.006	0.008	0.009	0.012	0.015	0.023
Titanium		1xD	0.1xD		60	70	80	100	0.001	0.003	0.005	0.006	0.008	0.010	0.013	0.019

For TiN Coating: multiply by 0.9 the Cutting Speed of Z-coat in the table.

### LISTS D001 / D011 I

Material	Rockwell Hardness	Application			Vc-Cutting Speed			fz-feed per tooth in mm D - diameter in mm							
		Side Milling		Slotting	m/min	m/min	m/min	4	6	8	10	12	16	20	
		ap	ae												ap
Steels	<42	0.3xD	0.7xD		70	100	120	0.020	0.033	0.040	0.049	0.054	0.063	0.080	
Steels	42-48	0.3xD	0.7xD		60	80	100	0.019	0.031	0.037	0.046	0.050	0.059	0.074	
Steels	48-52	0.3xD	0.7xD		45	60	80	0.015	0.025	0.030	0.037	0.041	0.047	0.060	
Cast Iron <180 HB		0.3xD	0.7xD		100	140	160	0.030	0.050	0.060	0.074	0.081	0.095	0.120	
Cast Iron >180 HB		0.3xD	0.7xD		80	100	140	0.024	0.040	0.048	0.059	0.064	0.075	0.096	
Stainless Steels		0.3xD	0.7xD		60	80	100	0.022	0.037	0.045	0.055	0.060	0.070	0.089	
Titanium		0.3xD	0.7xD		60	80	100	0.021	0.034	0.042	0.051	0.056	0.065	0.083	

### LIST D501 I

Material	Application			Vc-Cutting Speed	fz-feed per tooth in mm D - diameter in mm							
	Side Milling		Slotting	m/min	2	6	8	10	12	16	20	
	ap	ae										ap
Aluminium Alloys	0.3xD	0.7xD		250	0.016	0.044	0.055	0.085	0.114	0.120	0.132	
Aluminium High Silicon	0.3xD	0.7xD		180	0.013	0.032	0.041	0.062	0.084	0.130	0.120	

### LIST DC19 I

Material	Rockwell Hardness	Application			Vc-Cutting Speed	fz-feed per tooth in mm D - diameter in mm							
		Side Milling		Slotting	m/min	3	5	8	10	12	16	20	
		ap	ae										ap
Steels	<42	1xD	0.5xD	1xD	120	0.024	0.036	0.045	0.054	0.059	0.063	0.068	
Steels	42-48	1xD	0.4xD	1xD	100	0.023	0.032	0.041	0.045	0.050	0.054	0.059	
Steels	48-52	1xD	0.4xD	1xD	80	0.020	0.027	0.036	0.040	0.045	0.050	0.054	
Cast Iron <180 HB		1xD	0.2xD	0.5xD	160	0.010	0.015	0.024	0.024	0.034	0.044	0.050	
Cast Iron >180 HB		1xD	0.5xD	1xD	140	0.024	0.036	0.054	0.054	0.063	0.068	0.081	
Stainless Steels		1xD	0.3xD	0.5xD	100	0.011	0.018	0.027	0.027	0.036	0.041	0.054	
Titanium		1xD	0.4xD	1xD	100	0.024	0.036	0.054	0.054	0.063	0.068	0.081	

## RECOMMENDED WORKING DETAILS

### LISTS D000 / D010

Material	Rockwell Hardness	Application			Vc-Cutting Speed				fz-feed per tooth in mm D - diameter in mm						
		Side Milling		Slotting	m/min	m/min	m/min	m/min	4	6	8	10	12	16	20
	HRc	ap	ae	ap	Uncoated	Z-coat	TiCN	TiAlN							
Steels	<42	0.3xD	0.7xD		70	85	100	120	0.015	0.025	0.030	0.037	0.040	0.047	0.060
Steels	42-48	0.3xD	0.7xD		60	70	80	100	0.014	0.024	0.028	0.035	0.038	0.044	0.056
Steels	48-52	0.3xD	0.7xD		45	50	60	80	0.010	0.016	0.020	0.024	0.026	0.031	0.039
Cast Iron <180 HB		0.3xD	0.7xD		100	120	140	160	0.030	0.050	0.060	0.074	0.080	0.094	0.112
Cast Iron >180 HB		0.3xD	0.7xD		80	85	100	140	0.024	0.040	0.048	0.059	0.064	0.075	0.096
Stainless Steels		0.3xD	0.7xD		60	70	80	100	0.014	0.024	0.028	0.035	0.038	0.044	0.056
Titanium		0.3xD	0.7xD		60	70	80	100	0.014	0.024	0.028	0.035	0.038	0.044	0.056

### LISTS D002 / D012

Material	Rockwell Hardness	Application			Vc-Cutting Speed				fz-feed per tooth in mm D - diameter in mm							
		Side Milling		Slotting	m/min	m/min	m/min	m/min	2	4	6	8	10	12	16	20
	HRc	ap	ae	ap	Uncoated	Z-coat	TiCN	TiAlN								
Steels	<42			0.25xD	70	80	100	120	0.005	0.012	0.019	0.026	0.032	0.040	0.052	0.078
Steels	42-48			0.25xD	60	85	80	100	0.005	0.011	0.017	0.023	0.029	0.036	0.047	0.070
Steels	48-52			0.25xD	45	50	60	80	0.005	0.010	0.016	0.022	0.026	0.033	0.043	0.065
Cast Iron <180 HB				0.5xD	100	110	140	160	0.006	0.013	0.020	0.028	0.034	0.043	0.056	0.084
Cast Iron >180 HB				0.5xD	80	80	100	140	0.005	0.012	0.019	0.026	0.032	0.040	0.052	0.078
Stainless Steels				0.25xD	60	64	80	100	0.005	0.011	0.017	0.023	0.029	0.036	0.047	0.070
Titanium				0.25xD	60	64	80	100	0.005	0.011	0.017	0.023	0.029	0.036	0.047	0.070

### LIST D502

Material	Application			Vc-Cutting Speed	fz-feed per tooth in mm D - diameter in mm						
	Side Milling		Slotting	m/min	3	6	8	10	12	16	20
	ap	ae	ap	Uncoated							
Aluminium Alloys	1xD	0.5xD	1xD	250	0.013	0.037	0.046	0.071	0.095	0.100	0.110
Aluminium High Silicon	1xD	0.5xD	1xD	180	0.011	0.027	0.034	0.052	0.070	0.108	0.100

### LISTS D003 / D013

Material	Rockwell Hardness	Application			Vc-Cutting Speed				fz-feed per tooth in mm D - diameter in mm							
		Side Milling		Slotting	m/min	m/min	m/min	m/min	2	4	6	8	10	12	16	20
	HRc	ap	ae	ap	Uncoated	TiN	TiCN	TiAlN								
Steels	<42	1xD	0.1xD	0.25xD	70	80	100	120	0.004	0.010	0.015	0.021	0.026	0.032	0.042	0.062
Steels	42-48	1xD	0.1xD	0.25xD	60	65	80	100	0.004	0.009	0.014	0.019	0.023	0.029	0.037	0.056
Steels	48-52	1xD	0.1xD		45	48	60	80	0.004	0.008	0.013	0.017	0.021	0.026	0.034	0.052
Cast Iron <180 HB		1xD	0.1xD		100	110	140	160	0.005	0.010	0.016	0.022	0.028	0.034	0.045	0.067
Cast Iron >180 HB		1xD	0.1xD		80	80	100	140	0.004	0.010	0.015	0.021	0.026	0.032	0.042	0.062
Stainless Steels		1xD	0.1xD		60	65	80	100	0.004	0.009	0.014	0.019	0.023	0.029	0.037	0.056
Titanium		1xD	0.1xD		60	65	80	100	0.004	0.009	0.014	0.019	0.023	0.029	0.037	0.056

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## RECOMMENDED WORKING DETAILS

### LISTS D503 / D513 I

Material	Rockwell Hardness HRc	Application			Vc-Cutting Speed			fz-feed per tooth in mm D - diameter in mm							
		Side Milling		Slotting	m/min	m/min	m/min	2	4	6	8	10	12	16	20
		ap	ae	ap	Uncoated	TiCN	TiAlN								
Steels	<42	1xD	0.1xD	0.25XD	70	100	120	0.003	0.006	0.010	0.014	0.017	0.021	0.028	0.041
Steels	42-48	1xD	0.1xD	0.25XD	60	80	100	0.004	0.008	0.013	0.018	0.022	0.028	0.036	0.054
Steels	48-52	1xD	0.1xD	0.25XD	45	60	80	0.003	0.008	0.012	0.017	0.021	0.026	0.033	0.050
Cast Iron <180 HB		1xD	0.1xD	0.5XD	100	140	160	0.003	0.007	0.011	0.015	0.018	0.023	0.030	0.045
Cast Iron >180 HB		1xD	0.1xD	0.5XD	80	100	140	0.003	0.007	0.011	0.015	0.018	0.023	0.030	0.045
Stainless Steels		1xD	0.1xD	0.25XD	60	80	100	0.004	0.008	0.010	0.018	0.022	0.028	0.036	0.054
Titanium		1xD	0.1xD	0.25XD	60	80	100	0.004	0.008	0.013	0.018	0.022	0.028	0.036	0.054

### LIST DC03 I

Material	Type	Slotting ap	Vc-Cutting Speed m/min	fz-feed per tooth in mm D-Diameter in mm					
				TiAlN	6	8	10	12	16
Stainless Steels	AISI 304 & AISI 316	0.5 x D	80-90	0.030	0.040	0.050	0.065	0.075	0.080
Stainless Steels	AISI 303	0.5 x D	80-90	0.030	0.040	0.050	0.065	0.075	0.080
Stainless Steels	AISI 416 & AISI 420	0.5 x D	100-115	0.035	0.045	0.055	0.070	0.080	0.090

### LISTS D004 / D014 I

Material	Rockwell Hardness HRc	Application			Vc-Cutting Speed				fz-feed per tooth in mm D - diameter in mm							
		Side Milling		Slotting	m/min	m/min	m/min	m/min	2	4	6	8	10	12	16	20
		ap	ae	ap	Uncoated	Z-coat	TiCN	TiAlN								
Steels	<42	1xD	0.1xD		70	85	100	120	0.006	0.015	0.026	0.032	0.050	0.065	0.100	0.130
Steels	42-48	1xD	0.1xD		60	70	80	100	0.005	0.013	0.022	0.027	0.043	0.055	0.085	0.111
Steels	48-52	1xD	0.1xD		45	50	60	80	0.004	0.011	0.018	0.022	0.035	0.046	0.070	0.091
Cast Iron <180 HB		1xD	0.1xD		100	120	140	160	0.007	0.017	0.029	0.035	0.055	0.072	0.110	0.143
Cast Iron >180 HB		1xD	0.1xD		80	85	100	140	0.004	0.004	0.007	0.009	0.011	0.014	0.018	0.027
Stainless Steels		1xD	0.1xD		60	70	80	100	0.004	0.004	0.006	0.008	0.009	0.012	0.015	0.023
Titanium		1xD	0.1xD		60	70	80	100	0.003	0.003	0.005	0.006	0.008	0.010	0.013	0.019

### LISTS D507 / D517 I

Material	Rockwell Hardness HRc	Application			Vc-Cutting Speed		fz-feed per tooth in mm D-Diameter in mm					
		Side Milling		Slotting	m/min	m/min	6	8	10	12	16	20
		ap	ae	ap	TiCN	TiAlN						
Steels	<42	1xD	0.1xD		150	200	0.033	0.040	0.050	0.060	0.090	0.120
Steels	42-48	1xD	0.1xD		100	150	0.031	0.035	0.042	0.055	0.082	0.100
Steels	48-55	1xD	0.1xD		80	120	0.029	0.031	0.042	0.050	0.076	0.082
Cast Iron <180 HB		1xD	0.1xD		180	220	0.037	0.050	0.062	0.075	0.110	0.110
Cast Iron >180 HB		1xD	0.1xD		150	200	0.032	0.045	0.055	0.067	0.100	0.120
Stainless Steels		1xD	0.1xD		120	150	0.026	0.037	0.046	0.055	0.083	0.100
Titanium		1xD	0.1xD		150	200	0.031	0.035	0.042	0.055	0.082	0.100

## RECOMMENDED WORKING DETAILS

### LIST D518 |

Material	Rockwell Hardness	Application			Vc-Cutting Speed		fz- feed per tooth in mm D-Diameter in mm						
		Side Milling		Slotting	m/min	m/min							
		ap	ae	ap	TiCN	TiAlN	4	6	8	10	12	16	20
Steels	40-50	1.5 x D	0.07 x D	0.2 x D	80	300	0.021	0.026	0.037	0.046	0.055	0.083	0.110
Steels	50-55	1.5 x D	0.05 x D	0.18 x D	60	250	0.018	0.024	0.034	0.042	0.050	0.076	0.100
Steels	55-60	1.5 x D	0.03 x D	0.13 x D	50	180	0.013	0.018	0.024	0.034	0.042	0.050	0.076
Steels	>= 60	1.5 x D	0.025 x D	0.1 x D		120	0.009	0.013	0.018	0.024	0.034	0.042	0.050

### LIST D618 |

Material	Rockwell Hardness	Applications			Vc-Cutting Speed m/min	fz- feed per tooth in mm D-Diameter in mm							
		Side Milling		Slotting									
		HRc	ap	ae	ap	TiAlN	4	6	8	10	12	16	20
Steels	45~55	≤1xD	0.05xD	≤0.05xD	120-180	0.017	0.025	0.033	0.035	0.041	0.050	0.055	0.058
Steels	55~60	≤1xD	0.05xD	≤0.05xD	80-120	0.016	0.024	0.031	0.032	0.038	0.045	0.052	0.055
Steels	60~65	≤1xD	≤0.2	≤0.05xD	50-80	0.014	0.023	0.029	0.031	0.036	0.042	0.051	0.052
Steels	65~70	≤1xD	≤0.2	≤0.05xD	20-50	0.015	0.022	0.028	0.030	0.035	0.041	0.050	0.051

CARBIDE  
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#### NOTE

Data shown is the result of actual machining tests and is suggested as a starting point. Do sensitivity analyses to achieve optimum results. The tests were run on an optimal machining environment.

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## → HSSE/HSS PM FINISHERS |



The Hanita line provides a full range of end mills made from the highest quality Cobalt and Powder Metal steels. Providing maximum toughness and durability, often required when conventional or slow spindle machines are used, or workpieces are held in less-than rigid set ups, Hanita's HSSE / HSS-PM finishing end mills can provide excellent alternatives to carbide.

Hanita's standard offering for non ferrous materials are made from premium cobalt and powdered metal materials.

- Standard cutting diameters range from 1mm to 50mm (1/16-2").
- Available as standard in:
  - 2, 3, 4 and 6 flute styles
  - 30, 35, 37 and 45 Degree helixes
  - stub, regular, long and extra lengths
  - TiN, TiCN and TiAlN Coatings



Description	LIST	Page
2 Flutes Ball Nose	1601	87
2 Flutes Ball Nose, Long Shank	1601 JJ	87
2 Flutes Square end	1602/1612	88
2 Flutes Square end	1N02	89
2 Flutes Square end, High Helix	3502	89
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3 Flutes Square end	1603	91
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4 Flutes Square end	1605/1615	92
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Corner Rounding Cutter	5870	97
Recommended Working Details		98-100

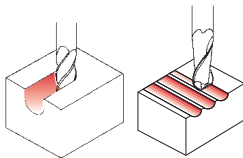
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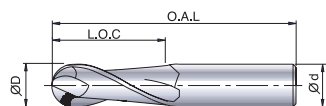
# → HSSE/HSS PM FINISHERS |

## 2 FLUTES BALL NOSE LIST 1601 HSS Co

for 3D Milling

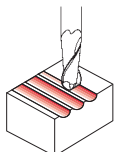
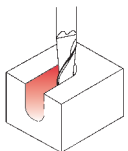


D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	5	49	2	160103002
4	6	7	51	2	160104002
5	6	8	52	2	160105002
6	6	8	52	2	160106002
7	10	10	60	2	160107004
8	10	11	61	2	160108004
10	10	13	63	2	160110004
12	12	16	73	2	160112005
14	12	16	73	2	160114005
16	16	19	79	2	160116006
18	16	19	79	2	160118006
20	16	19	79	2	160120006
25	25	26	102	2	160125008

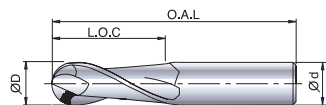


## 2 FLUTES BALL NOSE | LONG SHANK LIST 1601 JJ HSS Co

for Deep 3D Milling



D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
1	6	2	49	2	160101002
2	6	4	52	2	160102002
2.5	6	5	55	2	160102502
3	6	8	60	2	160103002
4	6	8	70	2	160104002
5	6	10	80	2	160105002
6	6	12	90	2	160106002
8	8	14	100	2	160108003
10	10	18	100	2	160110004
12	12	22	110	2	160112005
14	12	26	110	2	160114005
16	16	30	140	2	160116006
18	16	30	140	2	160118006
20	20	38	160	2	160120007
25	25	50	180	2	160125008



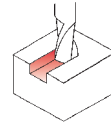
for General Purpose Slotting

## 2 FLUTES SQUARE END LISTS 1602 / 1612 HSS Co

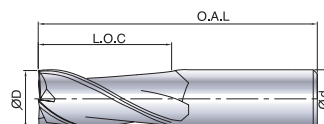
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2	6	4	48	2	160202002
2.5	6	5	49	2	160202502
3	6	5	49	2	160203002
3	6	9	60	2	161203002
3.5	6	6	50	2	160203502
4	6	7	51	2	160204002
4	6	13	67	2	161204002
4.5	6	7	51	2	160204502
5	6	8	52	2	160205002
5	6	13	71	2	161205002
5.5	6	8	52	2	160205502
6	6	8	52	2	160206002
6	6	16	75	2	161206002
6.5	10	10	60	2	160206504
7	10	10	60	2	160207004
7	10	16	75	2	161207004
7.5	10	10	60	2	160207504
8	10	11	61	2	160208004
8	10	20	80	2	161208004
8.5	10	11	61	2	160208504
9	10	11	61	2	160209004
9	10	22	80	2	161209004
9.5	10	11	61	2	160209504
10	10	13	63	2	160210004
10	10	22	80	2	161210004
10.5	12	13	70	2	160210505
11	12	13	70	2	160211005
12	12	16	73	2	160212005
12	12	25	100	2	161212005
12.5	12	16	73	2	160212505
13	12	16	73	2	160213005
13.5	12	16	73	2	160213505
14	12	16	73	2	160214005
14	12	28	100	2	161214005
15	12	16	73	2	160215005
16	16	19	79	2	160216006
16	16	32	116	2	161216006
17	16	19	79	2	160217006
18	16	19	79	2	160218006
18	16	35	118	2	161218006
19	16	19	79	2	160219006
20	16	19	79	2	160220006
20	20	22	88	2	160220007
20	16	38	125	2	161220006
21	20	22	88	2	160221007
22	20	22	88	2	160222007
22	25	40	140	2	161222008
24	25	26	102	2	160224008
24	25	45	150	2	161224008
25	25	26	102	2	160225008
25	25	45	160	2	161225008
26	25	26	102	2	160226008
28	25	26	102	2	160228008
30	25	26	102	2	160230008
32	32	32	112	2	160232009



\* Only For list 1602



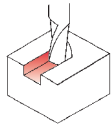
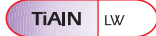
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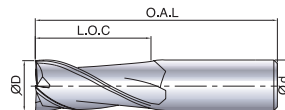
## → HSSE/HSS PM FINISHERS |

### 2 FLUTES SQUARE END LIST 1N02 HSS PM

for Slotting

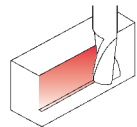
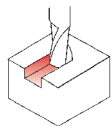


D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	5	49	2	1N0203002
4	6	7	51	2	1N0204002
5	6	8	52	2	1N0205002
6	6	8	52	2	1N0206002
8	10	11	61	2	1N0208004
10	10	13	63	2	1N0210004
12	12	16	73	2	1N0212005
14	12	16	73	2	1N0214005
16	16	19	79	2	1N0216006
18	16	19	79	2	1N0218006
20	20	22	88	2	1N0220007

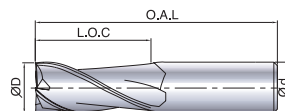


### 2 FLUTES SQUARE END | HIGH HELIX LIST 3502 HSS Co

for Roughing and Finishing Aluminium



D	d	L.O.C	O.A.L	Z	ITEM No.
2	6	7	51	2	350202002
3	6	8	52	2	350203002
4	6	11	55	2	350204002
5	6	13	57	2	350205002
6	6	13	57	2	350206002
8	10	19	69	2	350208002
10	10	22	72	2	350210004
12	12	26	83	2	350212005
14	12	26	83	2	350214005
16	16	32	92	2	350216006
18	16	32	92	2	350218006
20	16	38	98	2	350220006
22	25	40	106	2	350222008
24	25	45	121	2	350224008
25	25	45	121	2	350225008



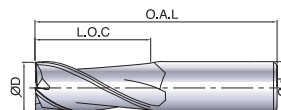
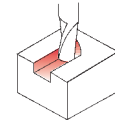
for Deep Slotting

**2 FLUTES SQUARE END | LONG TYPE**  
**LISTS 1652JJ / 1662JJ HSS Co**

D	d	L.O.C	O.A.L	Z	ITEM No.
2	6	4	50	2	165202002
3	6	6	50	2	165203002
3	6	15	50	2	166203002
4	8	8	60	2	165204003
4	6	20	55	2	166204002
5	8	10	60	2	165205003
5	6	25	60	2	166205002
6	8	12	60	2	165206003
6	6	25	60	2	166206002
7	10	14	60	2	165207004
8	10	14	60	2	165208004
8	10	35	80	2	166208004
9	10	18	70	2	165209004
10	10	18	70	2	165210004
10	10	45	90	2	166210004
11	12	22	80	2	165211005
12	12	22	80	2	165212005
12	12	55	105	2	166212005
13	12	26	85	2	165213005
14	16	26	90	2	165214006
14	12	55	105	2	166214005
15	16	30	95	2	165215006
16	16	30	95	2	165216006
16	16	65	120	2	166216006
17	16	34	95	2	165217006
18	16	34	95	2	165218006
18	16	65	120	2	166218006
19	20	38	110	2	165219007
20	20	38	110	2	165220007
20	20	75	140	2	166220007
22	20	45	110	2	165222007
24	25	50	120	2	165224008
24	25	90	160	2	166224008
25	25	50	120	2	165225008
25	25	90	160	2	166225008
35	32	60	145	2	165235009
45	42	70	160	2	165245001
50	42	75	165	2	165250001



\* Only For list 1652JJ

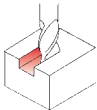
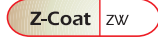


HSSE/HSS PM  
FINISHERS

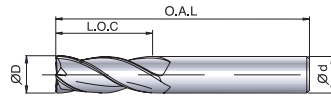
# → HSSE/HSS PM FINISHERS I

## 3 FLUTES SQUARE END LIST 1603 HSS Co

for Slotting and Side Milling

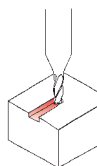


D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	8	52	3	160303002
3.5	6	10	54	3	160303502
4	6	11	55	3	160304002
4.5	6	11	55	3	160304502
5	6	13	57	3	160305002
5.5	6	13	57	3	160305502
6	6	13	57	3	160306002
6.5	10	16	66	3	160306504
7	10	16	66	3	160307004
8	10	19	69	3	160308004
9	10	19	69	3	160309004
10	10	22	72	3	160310004
11	12	22	79	3	160311005
12	12	26	83	3	160312005
14	12	26	83	3	160314005
15	12	26	83	3	160315005
16	16	32	92	3	160316006
18	16	32	92	3	160318006
20	16	38	98	3	160320006
25	25	45	121	3	160325008

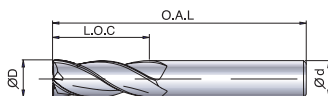


## 3 FLUTES SQUARE END | THROW-AWAY LISTS 3603AA / 3613AA HSS Co

for Slotting and Side Milling -  
General Purpose



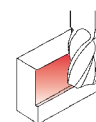
D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
1.5	6	3	34	3	360301502
1.5	6	4	38	3	361301502
2	6	4	35	3	360302002
2	6	7	38	3	361302002
2.5	6	5	36	3	360302502
2.5	6	8	39	3	361302502
3	6	5	36	3	360303002
3	6	8	39	3	361303002
3.5	6	6	37	3	360303502
3.5	6	10	41	3	361303502
4	6	7	38	3	360304002
4	6	11	42	3	361304002
4.5	6	7	38	3	360304502
4.5	6	11	42	3	361304502
5	6	8	39	3	360305002
5	6	13	44	3	361305002
5.5	6	8	39	3	360305502
5.5	6	13	44	3	361305502
6	6	8	39	3	360306002
6	6	13	44	3	361306002
7	8	10	42	3	360307003
7	8	16	48	3	361307003
8	8	11	43	3	360308003
8	8	19	51	3	361308003
9	10	11	48	3	360309004
9	10	19	56	3	361309004
10	10	13	50	3	360310004
10	10	22	59	3	361310004



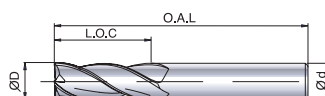
for Peripheral  
Finishing Operation

## 4 FLUTES SQUARE END LISTS 1605 / 1615 HSS Co

D(+0.04)	d	L.O.C	O.A.L	Z	ITEM No.
2	6	7	51	4	160502002
2.5	6	8	52	4	160502502
3	6	8	52	4	160503002
3	6	12	56	4	161503002
3.5	6	10	54	4	160503502
4	6	11	55	4	160504002
4	6	19	63	4	161504002
4.5	6	11	55	4	160504502
5	6	13	57	4	160505002
5	6	24	68	4	161505002
5.5	6	13	57	4	160505502
6	6	13	57	4	160506002
6	6	24	68	4	161506002
6.5	10	16	66	4	160506504
7	10	16	66	4	160507004
7	10	30	80	4	161507004
7.5	10	16	66	4	160507504
8	10	19	69	4	160508004
8	10	38	88	4	161508004
8.5	10	19	69	4	160508504
9	10	19	69	4	160509004
9	10	38	88	4	161509004
9.5	10	19	69	4	160509504
10	10	22	72	4	160510004
10	10	45	95	4	161510004
10.5	12	22	79	4	160510505
11	12	22	79	4	160511005
11	12	45	102	4	161511005
11.5	12	22	79	4	160511505
12	12	26	83	4	160512005
12	12	53	110	4	161512005
12.5	12	26	83	4	160512505
13	12	26	83	4	160513005
13	12	53	110	4	161513005
13.5	12	26	83	4	160513505
14	12	26	83	4	160514005
14	12	53	110	4	161514005
14.5	12	26	83	4	160514505
15	12	26	83	4	160515005
15	12	53	110	4	161515005
16	16	32	92	4	160516006
16	16	63	123	4	161516006
17	16	32	92	4	160517006
17	16	63	123	4	161517006
18	16	32	92	4	160518006
18	16	63	123	4	161518006
18.5	16	32	92	4	160518506
19	16	32	92	4	160519006
19	16	63	123	4	161519006
20	16	38	98	4	160520006
20	20	38	104	4	160520007
20	20	75	141	4	161520007



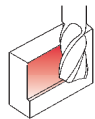
HSSE/HSS PM  
FINISHERS



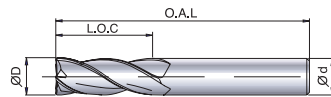
# ➔ HSSE/HSS PM FINISHERS I

## 4 FLUTES SQUARE END LIST 1634 JJ HSS Co

for Deep Peripheral Finishing Operation

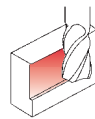


D	d	L.O.C	O.A.L	Z	ITEM No.
3	6	10	50	4	163403002
4	8	12	60	4	163404003
5	8	15	60	4	163405003
6	8	15	60	4	163406003
7	10	20	60	4	163407004
8	10	20	60	4	163408004
9	10	25	70	4	163409004
10	10	25	70	4	163410004
11	12	30	80	4	163411005
12	12	30	80	4	163412005
13	12	35	85	4	163413005
14	16	35	90	4	163414006
15	16	40	95	4	163415006
16	16	40	95	4	163416006
17	16	40	95	4	163417006
18	16	40	95	4	163418006
19	20	45	110	4	163419007
20	20	45	110	4	163420007
22	20	45	110	4	163422007
24	25	50	120	4	163424008
25	25	50	120	4	163425008
28	25	55	125	4	163428008
30	25	55	125	4	163430008
32	32	60	145	4	163432009

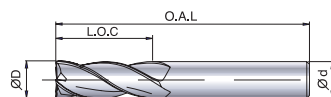


## 4 FLUTES SQUARE END LIST 1625 HSS Co

for Deep Peripheral Finishing Operation



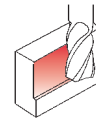
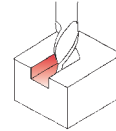
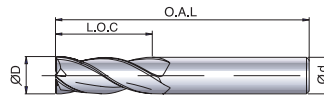
D	d	L.O.C	O.A.L	Z	ITEM No.
6	6	56	100	4	162506002
7	10	63	113	4	162507004
8	10	63	113	4	162508004
10	10	70	120	4	162510004
12	12	80	137	4	162512005
14	12	80	137	4	162514005
16	16	90	150	4	162516006
18	16	100	160	4	162518006
19	20	110	176	4	162519007
20	20	110	176	4	162520007
22	20	110	176	4	162522007
25	25	110	186	4	162525008



for High Performance Roughing and Finishing Operations

### 4 FLUTES SQUARE END LIST 1NOM HSS PM

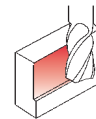
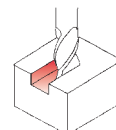
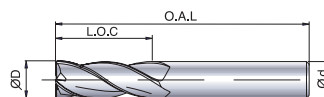
D(+0.04)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	8	52	4	1NOM03002
4	6	11	55	4	1NOM04002
5	6	13	57	4	1NOM05002
6	6	13	57	4	1NOM06002
8	10	19	69	4	1NOM08004
10	10	22	72	4	1NOM10004
12	12	26	83	4	1NOM12005
14	12	26	83	4	1NOM14005
16	16	32	92	4	1NOM16006
18	16	32	92	4	1NOM18006
20	20	38	104	4	1NOM20007
22	20	38	104	4	1NOM22007
25	25	45	121	4	1NOM25008



for High Performance Roughing and Finishing Operations

### 4 FLUTES SQUARE END LIST 1NOM JJ HSS PM

D(+0.04)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	10	50	4	1NOM03002
4	8	12	60	4	1NOM04003
5	8	15	60	4	1NOM05003
6	8	15	60	4	1NOM06003
8	10	20	65	4	1NOM08004
10	10	25	75	4	1NOM10004
12	12	30	80	4	1NOM12005
14	16	35	90	4	1NOM14006
16	16	40	95	4	1NOM16006
18	20	40	105	4	1NOM18007
20	20	45	110	4	1NOM20007
22	20	45	125	4	1NOM22007
25	25	50	130	4	1NOM25008

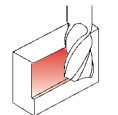
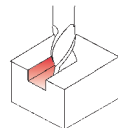
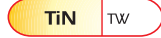


HSSE/HSS PM  
FINISHERS

# ➔ HSSE/HSS PM FINISHERS I

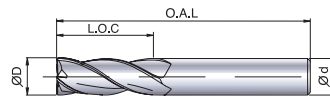
## 6 FLUTES SQUARE END LISTS 1606 / 1616 HSS Co

for Peripheral Finishing Operation



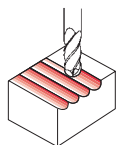
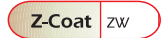
D	d	L.O.C	O.A.L	Z	ITEM No.
21	20	38	104	6	160621007
22	20	38	104	6	160622007
22	25	85	150	6	161622008
23	20	38	104	6	160623007
24	25	45	121	6	160624008
24	25	90	166	6	161624008
25	25	45	121	6	160625008
25	25	90	166	6	161625008
26	25	45	121	6	* 160626008
26	25	90	166	6	* 161626008
28	25	45	121	6	* 160628008
28	25	90	166	6	* 161628008
30	25	45	121	6	* 160630008
30	25	90	166	6	* 161630008
32	32	53	133	6	* 160632009
32	32	100	170	6	* 161632009
34	32	53	133	6	* 160634009
36	32	100	170	6	* 161636009
40	32	100	170	6	* 161640009

\* CENTRE HOLE



## MULTI- FLUTES BALL NOSE LIST 1600 HSS Co

for 3D Milling



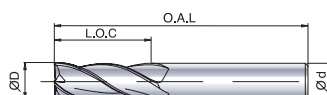
D	d	L.O.C	O.A.L	Z	ITEM No.
3	6	8	52	4	160003002
4	6	11	55	4	160004002
5	6	13	57	4	160005002
6	6	13	57	4	160006002
8	10	19	69	4	160008004
10	10	22	72	4	160010004
12	12	26	83	4	160012005
14	12	26	83	4	160014005
16	16	32	92	4	160016006
18	16	32	92	4	160018006
20	16	38	98	4	160020006
22	25	40	106	6	160022008
25	25	45	121	6	160025008



for Peripheral Finishing Operation

### MULTI-FLUTES SQUARE END LISTS 1N05 / 1N07 HSS - PM

D	d	L.O.C	O.A.L	Z	ITEM No.
6	6	13	57	4	1N0506002
8	10	19	69	4	1N0508004
10	10	22	72	4	1N0510004
12	12	26	83	4	1N0512005
14	12	26	83	4	1N0514005
16	16	32	92	4	1N0516006
18	16	32	92	4	1N0518006
20	20	38	104	4	1N0520007
25	25	45	121	6	1N0725008



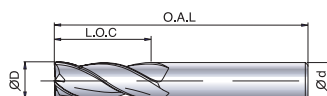
- HSS-PM 30°
- DIN-844 Standard
- Uncoated WW
- TiCN CW
- TiAlN LW
- 30>ST HRC
- GENERAL PURPOSE



for Slotting and Peripheral Finishing Operations

### MULTI FLUTES SQUARE END | HIGH HELIX LISTS 3605 / 3615 HSS Co

D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	8	52	3	360503002
4	6	11	55	3	360504002
5	6	13	57	3	360505002
6	6	13	57	3	360506002
7	10	16	66	3	360507004
8	10	19	69	3	360508004
9	10	19	69	3	360509004
10	10	22	72	3	360510004
10	10	45	95	3	361510004
12	12	26	83	3	360512005
12	12	53	110	3	361512005
14	12	26	83	3	360514005
15	12	26	83	3	360515005
16	16	32	92	3	360516006
16	16	63	123	3	361516006
18	16	32	92	3	360518006
20	20	38	104	3	360520007
20	20	75	141	3	361520007
22	20	38	104	4	360522007
25	25	45	121	4	360525008
25	25	90	166	4	361525008
28	25	45	121	4	360528008
30	25	45	121	4	360530008
30	25	90	166	4	361530008



- HSS-M42 45°
- DIN-844 Standard
- Uncoated \*\*WW
- TiCN CW, CT\*
- TiAlN LW
- \* Only for list 3605
- Al
- AlSi
- St S
- Ti
- INCONEL
- 30>ST HRC

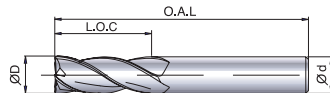
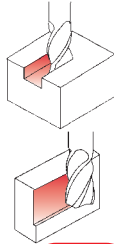


HSS/PM  
FINISHERS

## → HSSE/HSS PM FINISHERS |

### MULTI FLUTES SQUARE END | HIGH HELIX LIST 3N05 HSS - PM

for Slotting and Peripheral  
Finishing Operations



D(e8)	d	L.O.C	O.A.L	Z	ITEM No.
6	6	13	57	3	<b>3N0506002</b>
8	10	19	69	3	<b>3N0508004</b>
10	10	22	72	3	<b>3N0510004</b>
12	12	26	83	3	<b>3N0512005</b>
16	16	32	92	3	<b>3N0516006</b>
20	20	38	104	3	<b>3N0520007</b>
25	25	45	121	4	<b>3N0525008</b>

### CORNER ROUNDING CUTTER LIST 5870 HSS Co

for Corner Radius Milling



d	O.A.L	R	ITEM No.
8	60	1	<b>587000010</b>
10	60	2	<b>587000020</b>
12	60	3	<b>587000030</b>
14	60	4	<b>587000040</b>
16	60	5	<b>587000050</b>
20	64	6	<b>587000060</b>
24	64	7	<b>587000070</b>
24	73	8	<b>587000080</b>
28	79	10	<b>587000100</b>
35	83	12	<b>587000120</b>
42	90	14	<b>587000140</b>
48	90	16	<b>587000160</b>

## RECOMMENDED WORKING DETAILS

### FORMULAS

**Cutting Speed**  $V_c = \frac{D \times \pi \times n}{1000}$  (m/min)

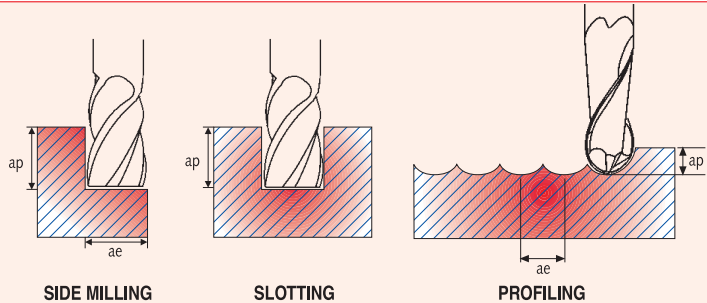
**Spindle Speed**  $n = \frac{V_c \times 1000}{\pi \times d}$  (1/min)

**Feed per Tooth**  $f_z = \frac{V_f}{z \times n}$  (mm)

**Table Feed**  $V_f = f_z \times z \times n$  (mm/min)

**Formula Symbols:**

- D (mm) Tool diameter
- z No. of Flutes
- V<sub>c</sub> (m/min) Cutting Speed
- F<sub>z</sub> (mm) Feed per Tooth
- n (1/min) Spindle Speed
- V<sub>f</sub> (mm/min) Table Feed
- π 3.1416



## LISTS 1602 / 1612 |

Material	Rockwell Hardness	Application			Vc-Cutting Speed				fz-feed per tooth in mm D - diameter in mm								
		Side Milling		Slotting	m/min	m/min	m/min	m/min	4	6	8	10	12	16	20	25	30
		ap	ae	ap													
Steels	<20			0.5xD	30	55	70	80	0.018	0.030	0.050	0.070	0.080	0.095	0.100	0.100	0.120
Steels	20-32			0.5xD	25	45	55	60	0.014	0.024	0.040	0.056	0.067	0.085	0.100	0.100	0.110
Steels	32-42			0.5xD	10	20	25	30	0.012	0.020	0.034	0.040	0.060	0.080	0.100	0.100	0.110
Cast Iron <180 HB				0.5xD	25	45	55	60	0.014	0.024	0.040	0.056	0.067	0.085	0.100	0.100	0.110
Cast Iron >180 HB				0.5xD	10	20	25	30	0.012	0.020	0.034	0.040	0.060	0.080	0.100	0.100	0.110
Stainless Steels				0.5xD	15	30	40	45	0.012	0.020	0.034	0.040	0.060	0.080	0.100	0.100	0.110
Titanium				0.5xD	15	30	40	45	0.012	0.020	0.034	0.040	0.060	0.080	0.100	0.100	0.110
High Temperature Alloys				0.25xD	6	7	9	12	0.006	0.011	0.080	0.030	0.035	0.045	0.060	0.080	0.090

## LIST 1N02 |

Material	Rockwell Hardness	Application			Vc-Cutting Speed			fz-feed per tooth in mm D - diameter in mm							
		Side Milling		Slotting	m/min	m/min	m/min	4	6	8	10	12	16	20	
		ap	ae	ap											
Steels	<20			0.5XD	25	55	65	0.011	0.029	0.051	0.064	0.070	0.093	0.124	
Steels	20-32			0.5XD	20	50	55	0.008	0.021	0.035	0.050	0.063	0.084	0.105	
Steels	32-42			0.5XD	18	48	50	0.010	0.024	0.042	0.058	0.070	0.089	0.105	
Cast Iron <180 HB				0.5XD	20	50	55	0.008	0.021	0.035	0.050	0.063	0.084	0.105	
Cast Iron >180 HB				0.5XD	18	48	50	0.010	0.024	0.042	0.058	0.070	0.089	0.105	
Stainless Steels				0.5XD	12	30	35	0.008	0.021	0.035	0.050	0.063	0.084	0.105	
Titanium				0.5XD	10	15	30	0.008	0.021	0.035	0.050	0.063	0.084	0.105	
High Temperature Alloys				0.25XD	7	11	15	0.006	0.021	0.031	0.047	0.058	0.075	0.094	

HSSE/HSS PM FINISHERS

## LISTS 1605 / 1615 |

Material	Rockwell Hardness	Application			Vc-Cutting Speed				fz-feed per tooth in mm D - diameter in mm								
		Side Milling		Slotting	m/min	m/min	m/min	m/min	4	6	8	10	12	16	20	25	30
		ap	ae	ap													
Steels	<20	1.5XD	0.1XD		30	55	70	80	0.014	0.025	0.044	0.550	0.060	0.080	0.106	0.120	0.126
Steels	20-32	1.5XD	0.1XD		25	45	55	60	0.010	0.018	0.030	0.043	0.054	0.072	0.090	0.106	0.120
Steels	32-42	1.5XD	0.1XD		10	20	25	30	0.013	0.021	0.036	0.050	0.060	0.076	0.090	0.106	0.120
Cast Iron <180 HB		1.5XD	0.1XD		25	45	55	60	0.010	0.018	0.030	0.043	0.054	0.072	0.090	0.106	0.120
Cast Iron >180 HB		1.5XD	0.1XD		10	20	25	30	0.013	0.021	0.036	0.050	0.060	0.076	0.090	0.106	0.120
Stainless Steels		1.5XD	0.1XD		15	30	40	45	0.010	0.018	0.030	0.043	0.054	0.072	0.090	0.106	0.120
Titanium		1.5XD	0.1XD		15	30	40	45	0.010	0.018	0.030	0.043	0.054	0.072	0.090	0.106	0.120
High Temperature Alloys		1.5XD	0.1XD		6	7	9	12	0.008	0.018	0.027	0.040	0.050	0.064	0.081	0.090	0.120

# ➔ HSSE/HSS PM FINISHERS |

## RECOMMENDED WORKING DETAILS

### LIST 1634JJ |

Material	Rockwell Hardness	Application			Vc-Cutting Speed				fz-feed per tooth in mm D - diameter in mm								
		Side Milling		Slotting	m/min	m/min	m/min	m/min	4	6	8	10	12	16	20	25	30
		ap	ae	ap	Uncoated	TiN	TiCN	TiAlN									
Steels	<20	1.5XD	0.1XD	0.5XD	30	55	70	80	0.011	0.020	0.035	0.044	0.048	0.064	0.086	0.098	0.103
Steels	20-32	1.5XD	0.1XD		25	45	55	60	0.008	0.014	0.024	0.034	0.043	0.058	0.073	0.086	0.098
Steels	32-42	1.5XD	0.1XD		10	20	25	30	0.010	0.017	0.029	0.040	0.048	0.061	0.073	0.086	0.098
Cast Iron <180 HB		1.5XD	0.1XD		25	45	55	60	0.008	0.014	0.024	0.034	0.043	0.058	0.073	0.086	0.098
Cast Iron >180 HB		1.5XD	0.1XD		10	20	25	30	0.010	0.017	0.029	0.040	0.048	0.061	0.073	0.086	0.098
Stainless Steels		1.5XD	0.1XD		15	30	40	45	0.008	0.014	0.024	0.034	0.043	0.058	0.073	0.086	0.098
Titanium		1.5XD	0.1XD		15	30	40	45	0.008	0.014	0.024	0.034	0.043	0.058	0.073	0.086	0.098
High Temperature Alloys		1.5XD	0.1XD		6	7	9	12	0.006	0.014	0.022	0.032	0.040	0.051	0.066	0.073	0.080

### LIST 1625 |

Material	Rockwell Hardness	Application			Vc-Cutting Speed				fz-feed per tooth in mm D - diameter in mm								
		Side Milling		Slotting	m/min	m/min	m/min	m/min	4	6	8	10	12	16	20	25	30
		ap	ae	ap	Uncoated	TiN	TiCN	TiAlN									
Steels	<20	1.5XD	0.1XD		30	55	70	80	0.007	0.012	0.022	0.027	0.030	0.040	0.053	0.060	0.063
Steels	20-32	1.5XD	0.1XD		25	45	55	60	0.005	0.009	0.015	0.021	0.027	0.036	0.045	0.053	0.060
Steels	32-42	1.5XD	0.1XD		10	20	25	30	0.006	0.010	0.018	0.025	0.030	0.038	0.045	0.053	0.060
Cast Iron <180 HB		1.5XD	0.1XD		25	45	55	60	0.005	0.009	0.015	0.021	0.027	0.036	0.045	0.053	0.060
Cast Iron >180 HB		1.5XD	0.1XD		10	20	25	30	0.006	0.010	0.018	0.025	0.030	0.038	0.045	0.053	0.060
Stainless Steels		1.5XD	0.1XD		15	30	40	45	0.005	0.009	0.015	0.021	0.027	0.036	0.045	0.053	0.055
Titanium		1.5XD	0.1XD		15	30	40	45	0.005	0.009	0.015	0.021	0.027	0.036	0.045	0.053	0.055
High Temperature Alloys		1.5XD	0.1XD		6	7	9	12	0.004	0.009	0.013	0.020	0.025	0.032	0.040	0.045	0.050

### LIST 1N0M |

Material	Application			Cutting Speed m/min	fz- Feed Per Tooth in mm D- Diameter in mm												
	Side milling		Slotting		3	4	5	6	8	10	12	14	16	18	20	25	30
	ap	ae	ap	TiAlN													
Easy to cut stainless steels (304)	1XD	0.5XD	1XD	30~40	0.035	0.039	0.041	0.045	0.056	0.067	0.073	0.075	0.078	0.081	0.084	0.086	0.099
Moderately difficult to stainless steels	1XD	0.5XD	1XD	25~35	0.028	0.031	0.035	0.039	0.050	0.056	0.062	0.065	0.067	0.073	0.073	0.081	0.093
Difficult to cut stainless steels (316L)	1XD	0.5XD	1XD	15~30	0.025	0.028	0.031	0.034	0.045	0.050	0.056	0.060	0.062	0.067	0.067	0.069	0.079
Titanium	1XD	0.5XD	1XD	15~25	0.010	0.012	0.015	0.019	0.030	0.030	0.043	0.050	0.055	0.062	0.062	0.063	0.073
Soft Steels	1XD	0.5XD	1XD	40~60	0.033	0.040	0.050	0.060	0.080	0.090	0.100	0.110	0.120	0.120	0.125	0.130	0.132
High temperature alloys	1XD	0.3XD	0.5XD	8~15	0.013	0.017	0.020	0.022	0.034	0.034	0.045	0.042	0.050	0.056	0.067	0.081	0.093
Gray Cast Iron	1XD	0.4XD	1XD	40~50	0.034	0.038	0.041	0.045	0.067	0.067	0.078	0.080	0.084	0.090	0.101	0.115	0.132
Aluminium	1XD	0.5XD	1XD	120~150	0.040	0.045	0.050	0.060	0.080	0.100	0.120	0.150	0.017	0.170	0.180	0.190	0.200

### LISTS 1N05 / 1N07 |

Material	Rockwell Hardness	Application			Vc-Cutting Speed			fz-feed per tooth in mm D - diameter in mm								
		Side Milling		Slotting	m/min	m/min	m/min	4	6	8	10	12	16	20	25	30
		ap	ae	ap	Uncoated	TiCN	TiAlN									
Steels	<20	1.5XD	0.1XD		25	55	65	0.011	0.022	0.040	0.050	0.060	0.077	0.090	0.099	0.100
Steels	20-32	1.5XD	0.1XD		20	50	55	0.008	0.013	0.022	0.032	0.040	0.053	0.066	0.072	0.080
Steels	32-42	1.5XD	0.1XD		18	48	50	0.010	0.018	0.032	0.042	0.054	0.072	0.072	0.099	0.100
Cast Iron <180 HB		1.5XD	0.1XD		20	50	55	0.008	0.013	0.022	0.032	0.040	0.053	0.066	0.072	0.100
Cast Iron >180 HB		1.5XD	0.1XD		18	48	50	0.010	0.018	0.032	0.042	0.054	0.072	0.072	0.099	0.100
Stainless Steels		1.5XD	0.1XD		12	30	35	0.008	0.016	0.027	0.040	0.054	0.063	0.080	0.090	0.100
Titanium		1.5XD	0.1XD		10	15	30	0.008	0.016	0.027	0.040	0.054	0.063	0.080	0.090	0.100
High Temperature Alloys		1.5XD	0.1XD		7	11	15	0.006	0.018	0.027	0.040	0.050	0.063	0.080	0.090	0.100

## RECOMMENDED WORKING DETAILS

### LISTS 3605 /3615 I

Material	Rockwell Hardness	Application			Vc-Cutting Speed				fz-feed per tooth in mm D - diameter in mm								
		Side Milling		Slotting	m/min	m/min	m/min	m/min	4	6	8	10	12	16	20	25	30
	HRc	ap	ae	ap	Uncoated	TiN	TiCN	TiAlN									
Steels	<20	1.5XD	0.1XD	0.5XD	30	55	70	80	0.011	0.029	0.051	0.064	0.070	0.093	0.124	0.124	0.124
Steels	20-32	1.5XD	0.1XD	0.3XD	25	45	55	60	0.008	0.021	0.035	0.050	0.063	0.084	0.105	0.105	0.105
Steels	32-42	1.5XD	0.1XD		10	20	25	30	0.010	0.024	0.042	0.058	0.070	0.089	0.105	0.105	0.110
Cast Iron <180 HB		1.5XD	0.1XD		25	45	55	60	0.008	0.021	0.035	0.050	0.063	0.084	0.105	0.105	0.110
Cast Iron >180 HB		1.5XD	0.1XD		10	20	25	30	0.010	0.024	0.042	0.058	0.070	0.089	0.105	0.105	0.110
Stainless Steels		1.5XD	0.1XD	0.5XD	15	30	40	45	0.008	0.021	0.035	0.050	0.063	0.084	0.105	0.105	0.110
Titanium		1.5XD	0.1XD		15	30	40	45	0.008	0.021	0.035	0.050	0.063	0.084	0.105	0.105	0.110
High Temperature Alloys		1.5XD	0.1XD		6	7	9	12	0.006	0.021	0.031	0.047	0.058	0.075	0.094	0.105	0.110

### LIST 3N05 I

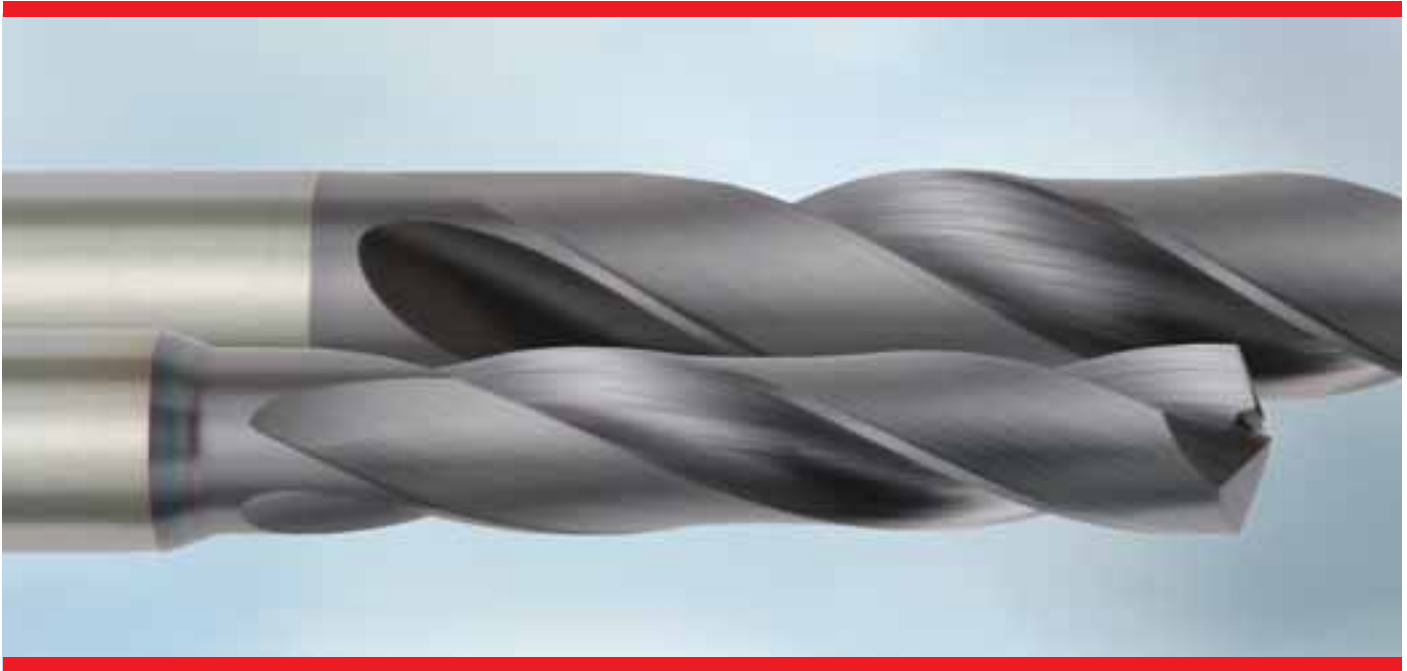
Material	Rockwell Hardness	Application			Vc-Cutting Speed			fz-feed per tooth in mm D - diameter in mm								
		Side Milling		Slotting	m/min	m/min	m/min	4	6	8	10	12	16	20	25	30
	HRc	ap	ae	ap	Uncoated	TiCN	TiAlN									
Steels	<20	1.5XD	0.1XD		25	55	65	0.011	0.022	0.040	0.050	0.060	0.077	0.090	0.099	0.100
Steels	20-32	1.5XD	0.1XD		20	50	55	0.008	0.013	0.022	0.032	0.040	0.053	0.066	0.072	0.080
Steels	32-42	1.5XD	0.1XD		18	48	50	0.010	0.018	0.032	0.042	0.054	0.072	0.072	0.099	0.100
Cast Iron <180 HB		1.5XD	0.1XD		20	50	55	0.008	0.013	0.022	0.032	0.040	0.053	0.066	0.072	0.100
Cast Iron >180 HB		1.5XD	0.1XD		18	48	50	0.010	0.018	0.032	0.042	0.054	0.072	0.072	0.099	0.100
Stainless Steels		1.5XD	0.1XD		12	30	35	0.008	0.016	0.027	0.040	0.054	0.063	0.080	0.090	0.100
Titanium		1.5XD	0.1XD		10	15	30	0.008	0.016	0.027	0.040	0.054	0.063	0.080	0.090	0.100
High Temperature Alloys		1.5XD	0.1XD		7	11	15	0.006	0.018	0.027	0.040	0.050	0.063	0.080	0.090	0.100

#### NOTE

Data shown is the result of actual machining tests and is suggested as a starting point. Do sensitivity analyses to achieve optimum results. The tests were run on an optimal machining environment.

---

## → CARBIDE DRILLS |



The perfect solution for high performance hole-making. Hanita's unique geometry and point styles provide high throughput, high accuracy and consistent performance in large variety of materials all the way up to hardened steels with 68 HRC. Available in over 1000 standard diameters of solid and coolant hole style drills.

- Provides exceptional tool life, while working at high speeds and feeds.
- Provides high quality dimensional tolerances and hole to hole accuracy.
- Reinforced shank for toughness and strength.
- Easy to regrind.
- Coolant hole drills offered in small diameters, starting at 3 mm (1/8").
- Specials, including step drills are available.



**Description**

**LIST**

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Jobber Drill Point 118°	_____	M112	103-104
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High Performance long Drill with Internal Coolant Point 140°	_____	M262	117-118
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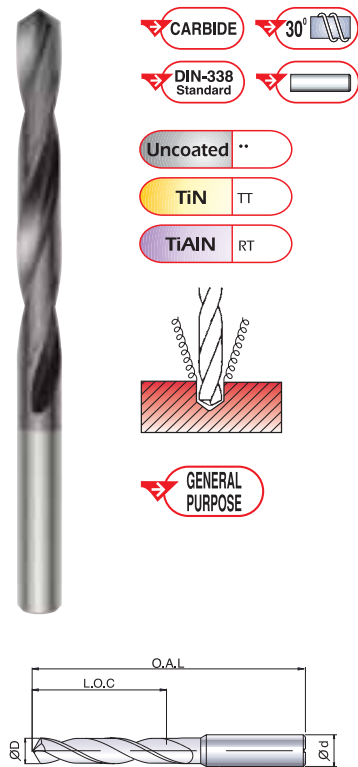
CARBIDE  
DRILLS



# → CARBIDE DRILLS |

## JOBBER DRILL | POINT 118° LIST M112

for General Purpose Drilling



D(h7)	d	L.O.C	O.A.L	Z	ITEM No.
1	1	12	34	2	M11201000
1.1	1.1	14	36	2	M11201100
1.2	1.2	16	38	2	M11201200
1.3	1.3	16	38	2	M11201300
1.4	1.4	18	40	2	M11201400
1.5	1.5	18	40	2	M11201500
1.6	1.6	20	43	2	M11201600
1.7	1.7	20	43	2	M11201700
1.8	1.8	22	46	2	M11201800
1.9	1.9	22	46	2	M11201900
2	2	24	49	2	M11202000
2.1	2.1	24	49	2	M11202100
2.2	2.2	27	53	2	M11202200
2.3	2.3	27	53	2	M11202300
2.4	2.4	30	57	2	M11202400
2.5	2.5	30	57	2	M11202500
2.6	2.6	30	57	2	M11202600
2.7	2.7	33	61	2	M11202700
2.8	2.8	33	61	2	M11202800
2.9	2.9	33	61	2	M11202900
3	3	33	61	2	M11203000
3.1	3.1	36	65	2	M11203100
3.2	3.2	36	65	2	M11203200
3.3	3.3	36	65	2	M11203300
3.4	3.4	39	70	2	M11203400
3.5	3.5	39	70	2	M11203500
3.6	3.6	39	70	2	M11203600
3.7	3.7	39	70	2	M11203700
3.8	3.8	43	75	2	M11203800
3.9	3.9	43	75	2	M11203900
4	4	43	75	2	M11204000
4.1	4.1	43	75	2	M11204100
4.2	4.2	43	75	2	M11204200
4.3	4.3	47	80	2	M11204300
4.4	4.4	47	80	2	M11204400
4.5	4.5	47	80	2	M11204500
4.6	4.6	47	80	2	M11204600
4.7	4.7	47	80	2	M11204700
4.8	4.8	52	86	2	M11204800
4.9	4.9	52	86	2	M11204900
5	5	52	86	2	M11205000
5.1	5.1	52	86	2	M11205100
5.2	5.2	52	86	2	M11205200
5.3	5.3	52	86	2	M11205300
5.4	5.4	57	93	2	M11205400
5.5	5.5	57	93	2	M11205500
5.6	5.6	57	93	2	M11205600
5.7	5.7	57	93	2	M11205700
5.8	5.8	57	93	2	M11205800
5.9	5.9	57	93	2	M11205900
6	6	57	93	2	M11206000
6.1	6.1	63	101	2	M11206100
6.2	6.2	63	101	2	M11206200
6.3	6.3	63	101	2	M11206300
6.4	6.4	63	101	2	M11206400
6.5	6.5	63	101	2	M11206500
6.6	6.6	63	101	2	M11206600

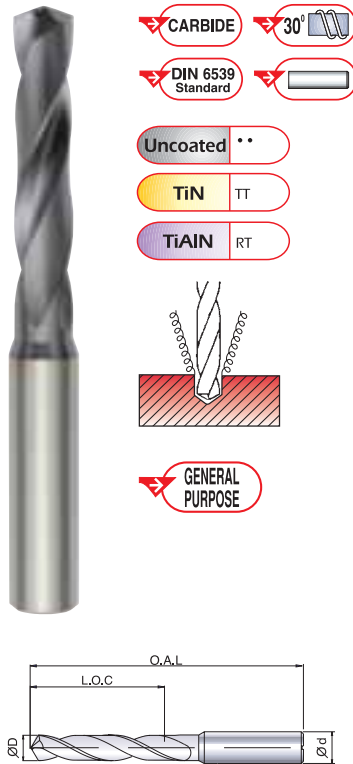
D(h7)	d	L.O.C	O.A.L	Z	ITEM No.
6.7	6.7	63	101	2	M11206700
6.8	6.8	69	109	2	M11206800
6.9	6.9	69	109	2	M11206900
7	7	69	109	2	M11207000
7.1	7.1	69	109	2	M11207100
7.2	7.2	69	109	2	M11207200
7.3	7.3	69	109	2	M11207300
7.4	7.4	69	109	2	M11207400
7.5	7.5	69	109	2	M11207500
7.6	7.6	75	117	2	M11207600
7.7	7.7	75	117	2	M11207700
7.8	7.8	75	117	2	M11207800
7.9	7.9	75	117	2	M11207900
8	8	75	117	2	M11208000
8.1	8.1	75	117	2	M11208100
8.2	8.2	75	117	2	M11208200
8.3	8.3	75	117	2	M11208300
8.4	8.4	75	117	2	M11208400
8.5	8.5	75	117	2	M11208500
8.6	8.6	81	125	2	M11208600
8.7	8.7	81	125	2	M11208700
8.8	8.8	81	125	2	M11208800
8.9	8.9	81	125	2	M11208900
9	9	81	125	2	M11209000
9.1	9.1	81	125	2	M11209100
9.2	9.2	81	125	2	M11209200
9.3	9.3	81	125	2	M11209300
9.4	9.4	81	125	2	M11209400
9.5	9.5	81	125	2	M11209500
9.6	9.6	87	133	2	M11209600
9.7	9.7	87	133	2	M11209700
9.8	9.8	87	133	2	M11209800
9.9	9.9	87	133	2	M11209900
10	10	87	133	2	M11210000
10.2	10.2	87	133	2	M11210200
10.5	10.5	87	133	2	M11210500
10.8	10.8	94	142	2	M11210800
11	11	94	142	2	M11211000
11.5	11.5	94	142	2	M11211500
12	12	101	151	2	M11212000
12.5	12.5	101	151	2	M11212500
13	13	101	151	2	*M11213000
13.5	13.5	108	160	2	*M11213500
14	14	108	160	2	*M11214000
14.5	14.5	114	169	2	*M11214500
15	15	114	169	2	*M11215000
15.5	15.5	120	178	2	*M11215500
16	16	120	178	2	*M11216000
16.5	16.5	125	184	2	*M11216500
17	17	125	184	2	*M11217000
17.5	17.5	130	191	2	*M11217500
18	18	130	191	2	*M11218000
18.5	18.5	135	198	2	*M11218500
19	19	135	198	2	*M11219000
19.5	19.5	140	205	2	*M11219500
20	20	140	205	2	*M11220000

\* Non stock items available upon request

# → CARBIDE DRILLS |

## STUB LENGTH DRILL | POINT 118° LIST M132

for General Purpose Drilling



D(h7)	d	L.O.C	O.A.L	Z	ITEM No.
0.5	0.5	6	26	2	M13200500
0.6	0.6	6	26	2	M13200600
0.7	0.7	6	26	2	M13200700
0.8	0.8	6	26	2	M13200800
0.9	0.9	6	26	2	M13200900
1	1	6	26	2	M13201000
1.1	1.1	7	28	2	M13201100
1.2	1.2	8	30	2	M13201200
1.3	1.3	8	30	2	M13201300
1.4	1.4	9	32	2	M13201400
1.5	1.5	9	32	2	M13201500
1.6	1.6	10	34	2	M13201600
1.7	1.7	10	34	2	M13201700
1.8	1.8	11	36	2	M13201800
1.9	1.9	11	36	2	M13201900
2	2	12	38	2	M13202000
2.1	2.1	12	38	2	M13202100
2.2	2.2	13	40	2	M13202200
2.3	2.3	13	40	2	M13202300
2.4	2.4	14	43	2	M13202400
2.5	2.5	14	43	2	M13202500
2.6	2.6	14	43	2	M13202600
2.7	2.7	16	46	2	M13202700
2.8	2.8	16	46	2	M13202800
2.9	2.9	16	46	2	M13202900
3	3	16	46	2	M13203000
3.1	3.1	18	49	2	M13203100
3.2	3.2	18	49	2	M13203200
3.3	3.3	18	49	2	M13203300
3.4	3.4	20	52	2	M13203400
3.5	3.5	20	52	2	M13203500
3.6	3.6	20	52	2	M13203600
3.7	3.7	20	52	2	M13203700
3.8	3.8	22	55	2	M13203800
3.9	3.9	22	55	2	M13203900
4	4	22	55	2	M13204000
4.1	4.1	22	55	2	M13204100
4.2	4.2	22	55	2	M13204200
4.3	4.3	24	58	2	M13204300
4.4	4.4	24	58	2	M13204400
4.5	4.5	24	58	2	M13204500
4.6	4.6	24	58	2	M13204600
4.7	4.7	24	58	2	M13204700
4.8	4.8	26	62	2	M13204800
4.9	4.9	26	62	2	M13204900
5	5	26	62	2	M13205000
5.1	5.1	26	62	2	M13205100
5.2	5.2	26	62	2	M13205200
5.3	5.3	26	62	2	M13205300
5.4	5.4	28	66	2	M13205400
5.5	5.5	28	66	2	M13205500
5.6	5.6	28	66	2	M13205600
5.7	5.7	28	66	2	M13205700
5.8	5.8	28	66	2	M13205800
5.9	5.9	28	66	2	M13205900
6	6	28	66	2	M13206000
6.1	6.1	31	70	2	M13206100
6.2	6.2	31	70	2	M13206200
6.3	6.3	31	70	2	M13206300

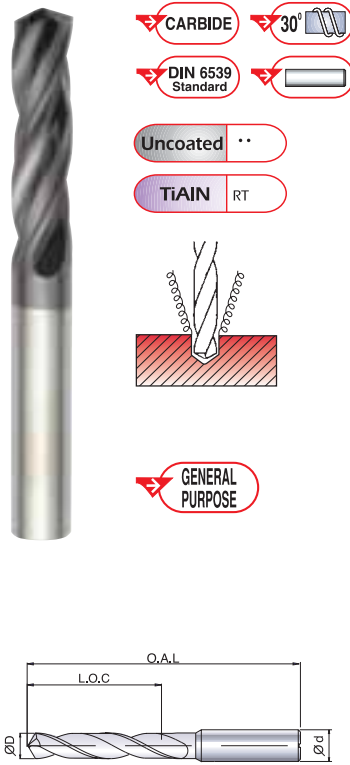
D(h7)	d	L.O.C	O.A.L	Z	ITEM No.
6.4	6.4	31	70	2	M13206400
6.5	6.5	31	70	2	M13206500
6.6	6.6	31	70	2	M13206600
6.7	6.7	31	70	2	M13206700
6.8	6.8	34	74	2	M13206800
6.9	6.9	34	74	2	M13206900
7	7	34	74	2	M13207000
7.1	7.1	34	74	2	M13207100
7.2	7.2	34	74	2	M13207200
7.3	7.3	34	74	2	M13207300
7.4	7.4	34	74	2	M13207400
7.5	7.5	34	74	2	M13207500
7.6	7.6	37	79	2	M13207600
7.7	7.7	37	79	2	M13207700
7.8	7.8	37	79	2	M13207800
7.9	7.9	37	79	2	M13207900
8	8	37	79	2	M13208000
8.1	8.1	37	79	2	M13208100
8.2	8.2	37	79	2	M13208200
8.3	8.3	37	79	2	M13208300
8.4	8.4	37	79	2	M13208400
8.5	8.5	37	79	2	M13208500
8.6	8.6	40	84	2	M13208600
8.7	8.7	40	84	2	M13208700
8.8	8.8	40	84	2	M13208800
8.9	8.9	40	84	2	M13208900
9	9	40	84	2	M13209000
9.1	9.1	40	84	2	M13209100
9.2	9.2	40	84	2	M13209200
9.3	9.3	40	84	2	M13209300
9.4	9.4	40	84	2	M13209400
9.5	9.5	40	84	2	M13209500
9.6	9.6	43	89	2	M13209600
9.7	9.7	43	89	2	M13209700
9.8	9.8	43	89	2	M13209800
9.9	9.9	43	89	2	M13209900
10	10	43	89	2	M13210000
10.2	10.2	43	89	2	M13210200
10.5	10.5	43	89	2	M13210500
10.8	10.8	47	95	2	M13210800
11	11	47	95	2	M13211000
11.5	11.5	47	95	2	M13211500
11.8	11.8	47	95	2	M13211800
12	12	51	102	2	M13212000
12.5	12.5	51	102	2	M13212500
13	13	51	102	2	*M13213000
13.5	13.5	54	107	2	*M13213500
14	14	54	107	2	*M13214000
14.5	14.5	56	111	2	*M13214500
15	15	56	111	2	*M13215000
15	15	58	115	2	*M13215500
16	16	58	115	2	*M13216000
16.5	16.5	60	119	2	*M13216500
17	17	60	119	2	*M13217000
17.5	17.5	62	123	2	*M13217500
18	18	62	123	2	*M13218000
18.5	18.5	64	127	2	*M13218500
19	19	64	127	2	*M13219000
19.5	19.5	66	131	2	*M13219500
20	20	66	131	2	*M13220000

\* Non stock items available upon request

# → CARBIDE DRILLS |

## 3 FLUTES STUB LENGTH DRILL | POINT 135° LIST M133

for Shallow Depth Holes with Self Centering



D(h7)	d	L.O.C	O.A.L	Z	ITEM No.
3	3	16	46	3	M13303000
3.1	3.1	18	49	3	M13303100
3.2	3.2	18	49	3	M13303200
3.3	3.3	18	49	3	M13303300
3.4	3.4	20	52	3	M13303400
3.5	3.5	20	52	3	M13303500
3.6	3.6	20	52	3	M13303600
3.7	3.7	20	52	3	M13303700
3.8	3.8	22	55	3	M13303800
3.9	3.9	22	55	3	M13303900
4	4	22	55	3	M13304000
4.1	4.1	22	55	3	M13304100
4.2	4.2	22	55	3	M13304200
4.3	4.3	24	58	3	M13304300
4.4	4.4	24	58	3	M13304400
4.5	4.5	24	58	3	M13304500
4.6	4.6	24	58	3	M13304600
4.7	4.7	24	58	3	M13304700
4.8	4.8	26	62	3	M13304800
4.9	4.9	26	62	3	M13304900
5	5	26	62	3	M13305000
5.1	5.1	26	62	3	M13305100
5.2	5.2	26	62	3	M13305200
5.3	5.3	26	62	3	M13305300
5.5	5.5	28	66	3	M13305500
5.6	5.6	28	66	3	M13305600
5.8	5.8	28	66	3	M13305800
6	6	28	66	3	M13306000
6.1	6.1	31	70	3	M13306100
6.2	6.2	31	70	3	M13306200
6.3	6.3	31	70	3	M13306300
6.5	6.5	31	70	3	M13306500
6.6	6.6	31	70	3	M13306600
6.7	6.7	31	70	3	M13306700
6.8	6.8	34	74	3	M13306800
6.9	6.9	34	74	3	M13306900
7	7	34	74	3	M13307000
7.1	7.1	34	74	3	M13307100
7.2	7.2	34	74	3	M13307200
7.3	7.3	34	74	3	M13307300
7.4	7.4	34	74	3	M13307400
7.5	7.5	34	74	3	M13307500
7.6	7.6	37	79	3	M13307600
7.7	7.7	37	79	3	M13307700
7.8	7.8	37	79	3	M13307800
7.9	7.9	37	79	3	M13307900
8	8	37	79	3	M13308000
8.1	8.1	37	79	3	M13308100
8.2	8.2	37	79	3	M13308200
8.3	8.3	37	79	3	M13308300
8.4	8.4	37	79	3	M13308400
8.5	8.5	37	79	3	M13308500
8.6	8.6	40	84	3	M13308600
8.7	8.7	40	84	3	M13308700
8.8	8.8	40	84	3	M13308800
8.9	8.9	40	84	3	M13308900
9	9	40	84	3	M13309000
9.1	9.1	40	84	3	M13309100
9.2	9.2	40	84	3	M13309200
9.3	9.3	40	84	3	M13309300

for Shallow Depth Holes with Self Centering

**3 FLUTES STUB LENGTH DRILL | POINT 135°  
LIST M133**

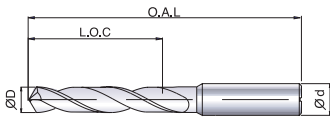
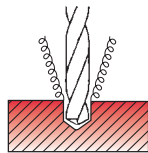
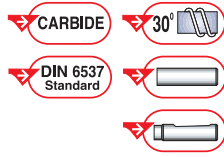
D(h7)	d	L.O.C	O.A.L	Z	ITEM No.
9.4	9.4	40	84	3	M13309400
9.5	9.5	40	84	3	M13309500
9.6	9.6	43	89	3	M13309600
9.7	9.7	43	89	3	M13309700
9.8	9.8	43	89	3	M13309800
9.9	9.9	43	89	3	M13309900
10	10	43	89	3	M13310000
10.2	10.2	43	89	3	M13310200
10.5	10.5	43	89	3	M13310500
10.8	10.8	47	95	3	M13310800
11	11	47	95	3	M13311000
11.5	11.5	47	95	3	M13311500
12	12	51	102	3	M13312000
12.5	12.5	51	102	3	M13312500
13	13	51	102	3	*M13313000
13.5	13.5	54	107	3	*M13313500
14	14	54	107	3	*M13314000
14.5	14.5	56	111	3	*M13314500
15	15	56	111	3	*M13315000
15.5	15.5	58	115	3	*M13315500
16	16	58	115	3	*M13316000
16.5	16.5	60	119	3	*M13316500
17.5	17.5	62	123	3	*M13317500
18	18	62	123	3	*M13318000
18.5	18.5	64	127	3	*M13318500
19	19	64	127	3	*M13319000
19.5	19.5	66	131	3	*M13319500
20	20	66	131	3	*M13320000

\* Non stock items available upon request

# → CARBIDE DRILLS I

## HIGH PERFORMANCE SHORT DRILL | POINT 140° LIST M152

for Drilling Depth of 3XD



D(m7)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	20	62	2	M15203000
3	6	20	62	2	M15203100
3.2	6	20	62	2	M15203200
3.3	6	20	62	2	M15203300
3.4	6	20	62	2	M15203400
3.5	6	20	62	2	M15203500
3.6	6	20	62	2	M15203600
3.7	6	20	62	2	M15203700
3.8	6	24	66	2	M15203800
3.9	6	24	66	2	M15203900
4	6	24	66	2	M15204000
4.1	6	24	66	2	M15204100
4.2	6	24	66	2	M15204200
4.3	6	24	66	2	M15204300
4.4	6	24	66	2	M15204400
4.5	6	24	66	2	M15204500
4.6	6	24	66	2	M15204600
4.7	6	24	66	2	M15204700
4.8	6	28	66	2	M15204800
4.9	6	28	66	2	M15204900
5	6	28	66	2	M15205000
5.1	6	28	66	2	M15205100
5.2	6	28	66	2	M15205200
5.3	6	28	66	2	M15205300
5.4	6	28	66	2	M15205400
5.5	6	28	66	2	M15205500
5.6	6	28	66	2	M15205600
5.7	6	28	66	2	M15205700
5.8	6	28	66	2	M15205800
5.9	6	28	66	2	M15205900
6	6	28	66	2	M15206000
6.1	8	34	79	2	M15206100
6.2	8	34	79	2	M15206200
6.3	8	34	79	2	M15206300
6.4	8	34	79	2	M15206400
6.5	8	34	79	2	M15206500
6.6	8	34	79	2	M15206600
6.7	8	34	79	2	M15206700
6.8	8	34	79	2	M15206800
6.9	8	34	79	2	M15206900
7	8	34	79	2	M15207000
7.1	8	41	79	2	M15207100
7.2	8	41	79	2	M15207200
7.3	8	41	79	2	M15207300
7.4	8	41	79	2	M15207400
7.5	8	41	79	2	M15207500
7.6	8	41	79	2	M15207600
7.7	8	41	79	2	M15207700
7.8	8	41	79	2	M15207800
7.9	8	41	79	2	M15207900
8	8	41	79	2	M15208000
8.1	10	47	89	2	M15208100
8.2	10	47	89	2	M15208200
8.3	10	47	89	2	M15208300
8.4	10	47	89	2	M15208400
8.5	10	47	89	2	M15208500
8.6	10	47	89	2	M15208600

for Drilling Depth of 3XD

**HIGH PERFORMANCE SHORT DRILL | POINT 140°  
LIST M152**

D(m7)	d	L.O.C	O.A.L	Z	ITEM No.
8.7	10	47	89	2	M15208700
8.8	10	47	89	2	M15208800
8.9	10	47	89	2	M15208900
9	10	47	89	2	M15209000
9.1	10	47	89	2	M15209100
9.2	10	47	89	2	M15209200
9.3	10	47	89	2	M15209300
9.4	10	47	89	2	M15209400
9.5	10	47	89	2	M15209500
9.6	10	47	89	2	M15209600
9.7	10	47	89	2	M15209700
9.8	10	47	89	2	M15209800
9.9	10	47	89	2	M15209900
10	10	47	89	2	M15210000
10.1	12	55	102	2	M15210100
10.2	12	55	102	2	M15210200
10.3	12	55	102	2	M15210300
10.4	12	55	102	2	M15210400
10.5	12	55	102	2	M15210500
10.6	12	55	102	2	M15210600
10.7	12	55	102	2	M15210700
10.8	12	55	102	2	M15210800
10.9	12	55	102	2	M15210900
11	12	55	102	2	M15211000
11.1	12	55	102	2	M15211100
11.2	12	55	102	2	M15211200
11.3	12	55	102	2	M15211300
11.4	12	55	102	2	M15211400
11.5	12	55	102	2	M15211500
11.6	12	55	102	2	M15211600
11.7	12	55	102	2	M15211700
11.8	12	55	102	2	M15211800
11.9	12	55	102	2	M15211900
12	12	55	102	2	M15212000
12.5	14	60	107	2	M15212500
12.8	14	60	107	2	M15212800
13	14	60	107	2	*M15213000
13.5	14	60	107	2	*M15213500
13.8	14	60	107	2	*M15213800
14	14	60	107	2	*M15214000
14.5	16	65	115	2	*M15214500
14.8	16	65	115	2	*M15214800
15	16	65	115	2	*M15215000
15.5	16	65	115	2	*M15215500
15.8	16	65	115	2	*M15215800
16	16	65	115	2	*M15216000
16.5	18	73	123	2	*M15216500
17	18	73	123	2	*M15217000
17.5	18	73	123	2	*M15217500
18	18	73	123	2	*M15218000
18.5	20	79	131	2	*M15218500
19	20	79	131	2	*M15219000
19.5	20	79	131	2	*M15219500
20	20	79	131	2	*M15220000

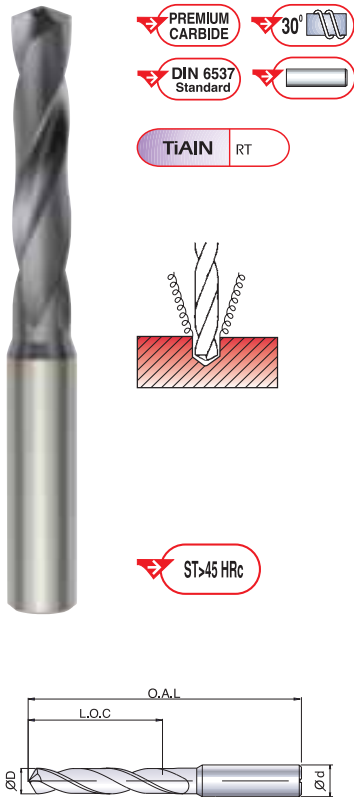
\* Non stock items available upon request

CARBIDE  
DRILLS

# → CARBIDE DRILLS |

## HIGH PERFORMANCE SHORT DRILL | POINT 140° LIST M155

for Drilling Depth of 3XD for Ultra Hard Steels



D(m7)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	20	62	2	M15503000
3.1	6	20	62	2	M15503100
3.2	6	20	62	2	M15503200
3.3	6	20	62	2	M15503300
3.4	6	20	62	2	M15503400
3.5	6	20	62	2	M15503500
3.6	6	20	62	2	M15503600
3.7	6	24	66	2	M15503700
3.8	6	24	66	2	M15503800
3.9	6	24	66	2	M15503900
4	6	24	66	2	M15504000
4.1	6	24	66	2	M15504100
4.2	6	24	66	2	M15504200
4.3	6	24	66	2	M15504300
4.4	6	24	66	2	M15504400
4.5	6	24	66	2	M15504500
4.6	6	24	66	2	M15504600
4.7	6	24	66	2	M15504700
4.8	6	28	66	2	M15504800
4.9	6	28	66	2	M15504900
5	6	28	66	2	M15505000
5.1	6	28	66	2	M15505100
5.2	6	28	66	2	M15505200
5.3	6	28	66	2	M15505300
5.4	6	28	66	2	M15505400
5.5	6	28	66	2	M15505500
5.6	6	28	66	2	M15505600
5.7	6	28	66	2	M15505700
5.8	6	28	66	2	M15505800
5.9	6	28	66	2	M15505900
6	6	28	66	2	M15506000
6.1	8	34	79	2	M15506100
6.2	8	34	79	2	M15506200
6.3	8	34	79	2	M15506300
6.4	8	34	79	2	M15506400
6.5	8	34	79	2	M15506500
6.6	8	34	79	2	M15506600
6.7	8	34	79	2	M15506700
6.8	8	34	79	2	M15506800
6.9	8	34	79	2	M15506900
7	8	34	79	2	M15507000
7.1	8	41	79	2	M15507100
7.2	8	41	79	2	M15507200
7.3	8	41	79	2	M15507300
7.4	8	41	79	2	M15507400
7.5	8	41	79	2	M15507500
7.6	8	41	79	2	M15507600
7.7	8	41	79	2	M15507700
7.8	8	41	79	2	M15507800
7.9	8	41	79	2	M15507900
8	8	41	79	2	M15508000
8.1	10	47	89	2	M15508100
8.2	10	47	89	2	M15508200
8.3	10	47	89	2	M15508300
8.4	10	47	89	2	M15508400
8.5	10	47	89	2	M15508500
8.6	10	47	89	2	M15508600
8.7	10	47	89	2	M15508700

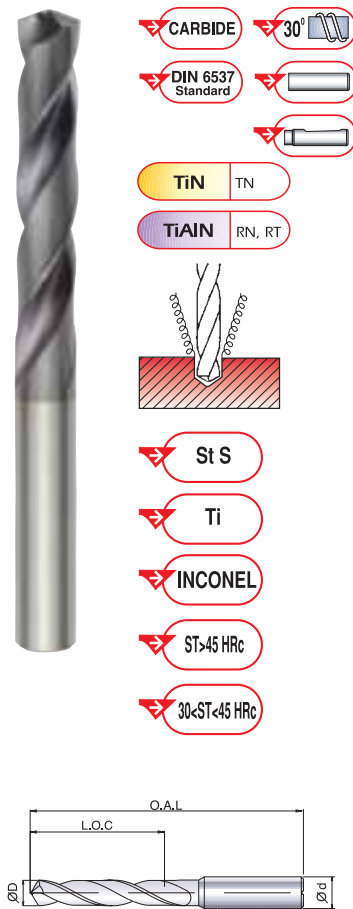
D(m7)	d	L.O.C	O.A.L	Z	ITEM No.
8.8	10	47	89	2	M15508800
8.9	10	47	89	2	M15508900
9	10	47	89	2	M15509000
9.1	10	47	89	2	M15509100
9.2	10	47	89	2	M15509200
9.3	10	47	89	2	M15509300
9.4	10	47	89	2	M15509400
9.5	10	47	89	2	M15509500
9.6	10	47	89	2	M15509600
9.7	10	47	89	2	M15509700
9.8	10	47	89	2	M15509800
9.9	10	47	89	2	M15509900
10	10	47	89	2	M15510000
10.1	12	55	102	2	M15510100
10.2	12	55	102	2	M15510200
10.3	12	55	102	2	M15510300
10.4	12	55	102	2	M15510400
10.5	12	55	102	2	M15510500
10.6	12	55	102	2	M15510600
10.7	12	55	102	2	M15510700
10.8	12	55	102	2	M15510800
10.9	12	55	102	2	M15510900
11	12	55	102	2	M15511000
11.1	12	55	102	2	M15511100
11.2	12	55	102	2	M15511200
11.3	12	55	102	2	M15511300
11.4	12	55	102	2	M15511400
11.5	12	55	102	2	M15511500
11.6	12	55	102	2	M15511600
11.7	12	55	102	2	M15511700
11.8	12	55	102	2	M15511800
11.9	12	55	102	2	M15511900
12	12	55	102	2	M15512000
12.5	14	60	107	2	M15512500
12.8	14	60	107	2	*M15512800
13	14	60	107	2	*M15513000
13.5	14	60	107	2	*M15513500
13.8	14	60	107	2	*M15513800
14	14	60	107	2	*M15514000
14.5	16	65	115	2	*M15514500
14.8	16	65	115	2	*M15514800
15	16	65	115	2	*M15515000
15.5	16	65	115	2	*M15515500
16	16	65	115	2	*M15516000
16.5	18	73	123	2	*M15516500
17	18	73	123	2	*M15517000
17.5	18	73	123	2	*M15517500
18	18	73	123	2	*M15518000
18.5	20	79	131	2	*M15518500
19	20	79	131	2	*M15519000
19.5	20	79	131	2	*M15519500
20	20	79	131	2	*M15520000

\* Non stock items available upon request

# → CARBIDE DRILLS |

## HIGH PERFORMANCE LONG DRILL | POINT 140° LIST M162

for Drilling Depth of 5XD



D(m7)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	28	66	2	M16203000
3.1	6	28	66	2	M16203100
3.2	6	28	66	2	M16203200
3.3	6	28	66	2	M16203300
3.4	6	28	66	2	M16203400
3.5	6	28	66	2	M16203500
3.6	6	28	66	2	M16203600
3.7	6	28	66	2	M16203700
3.8	6	36	74	2	M16203800
3.9	6	36	74	2	M16203900
4	6	36	74	2	M16204000
4.1	6	36	74	2	M16204100
4.2	6	36	74	2	M16204200
4.3	6	36	74	2	M16204300
4.4	6	36	74	2	M16204400
4.5	6	36	74	2	M16204500
4.6	6	36	74	2	M16204600
4.7	6	36	74	2	M16204700
4.8	6	44	82	2	M16204800
4.9	6	44	82	2	M16204900
5	6	44	82	2	M16205000
5.1	6	44	82	2	M16205100
5.2	6	44	82	2	M16205200
5.3	6	44	82	2	M16205300
5.4	6	44	82	2	M16205400
5.5	6	44	82	2	M16205500
5.6	6	44	82	2	M16205600
5.7	6	44	82	2	M16205700
5.8	6	44	82	2	M16205800
5.9	6	44	82	2	M16205900
6	6	44	82	2	M16206000
6.1	8	53	91	2	M16206100
6.2	8	53	91	2	M16206200
6.3	8	53	91	2	M16206300
6.4	8	53	91	2	M16206400
6.5	8	53	91	2	M16206500
6.6	8	53	91	2	M16206600
6.7	8	53	91	2	M16206700
6.8	8	53	91	2	M16206800
6.9	8	53	91	2	M16206900
7	8	53	91	2	M16207000
7.1	8	53	91	2	M16207100
7.2	8	53	91	2	M16207200
7.3	8	53	91	2	M16207300
7.4	8	53	91	2	M16207400
7.5	8	53	91	2	M16207500
7.6	8	53	91	2	M16207600
7.7	8	53	91	2	M16207700
7.8	8	53	91	2	M16207800
7.9	8	53	91	2	M16207900
8	8	53	91	2	M16208000
8.1	10	61	103	2	M16208100
8.2	10	61	103	2	M16208200
8.3	10	61	103	2	M16208300
8.4	10	61	103	2	M16208400
8.5	10	61	103	2	M16208500
8.6	10	61	103	2	M16208600

for Drilling Depth of 5XD

**HIGH PERFORMANCE LONG DRILL | POINT 140°  
LIST M162**

D(m7)	d	L.O.C	O.A.L	Z	ITEM No.
8.7	10	61	103	2	M16208700
8.8	10	61	103	2	M16208800
8.9	10	61	103	2	M16208900
9	10	61	103	2	M16209000
9.1	10	61	103	2	M16209100
9.2	10	61	103	2	M16209200
9.3	10	61	103	2	M16209300
9.4	10	61	103	2	M16209400
9.5	10	61	103	2	M16209500
9.6	10	61	103	2	M16209600
9.7	10	61	103	2	M16209700
9.8	10	61	103	2	M16209800
9.9	10	61	103	2	M16209900
10	10	61	103	2	M16210000
10.1	12	71	118	2	M16210100
10.2	12	71	118	2	M16210200
10.3	12	71	118	2	M16210300
10.4	12	71	118	2	M16210400
10.5	12	71	118	2	M16210500
10.6	12	71	118	2	M16210600
10.7	12	71	118	2	M16210700
10.8	12	71	118	2	M16210800
10.9	12	71	118	2	M16210900
11	12	71	118	2	M16211000
11.1	12	71	118	2	M16211100
11.2	12	71	118	2	M16211200
11.3	12	71	118	2	M16211300
11.4	12	71	118	2	M16211400
11.5	12	71	118	2	M16211500
11.6	12	71	118	2	M16211600
11.7	12	71	118	2	M16211700
11.8	12	71	118	2	M16211800
11.9	12	71	118	2	M16211900
12	12	71	118	2	M16212000
12.5	14	77	124	2	M16212500
13	14	77	124	2	*M16213000
13.5	14	77	124	2	*M16213500
14	14	77	124	2	*M16214000
14.5	16	83	133	2	*M16214500
15	16	83	133	2	*M16215000
15.5	16	83	133	2	*M16215500
16	16	83	133	2	*M16216000
16.5	18	93	143	2	*M16216500
17	18	93	143	2	*M16217000
17.5	18	93	143	2	*M16217500
18	18	93	143	2	*M16218000
18.5	20	101	153	2	*M16218500
19	20	101	153	2	*M16219000
19.5	20	101	153	2	*M16219500
20	20	101	153	2	*M16220000

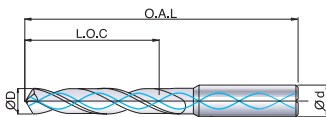
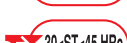
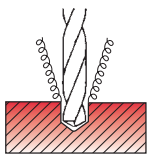
\* Non stock items available upon request

CARBIDE  
DRILLS

# → CARBIDE DRILLS |

## HIGH PERFORMANCE SHORT DRILL | INTERNAL COOLANT | POINT 140° LIST M252

for Drilling Depth of 3XD



D(m7)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	20	62	2	M25203000
3.1	6	20	62	2	M25203100
3.2	6	20	62	2	M25203200
3.3	6	20	62	2	M25203300
3.4	6	20	62	2	M25203400
3.5	6	20	62	2	M25203500
3.6	6	20	62	2	M25203600
3.7	6	20	62	2	M25203700
3.8	6	24	66	2	M25203800
3.9	6	24	66	2	M25203900
4	6	24	66	2	M25204000
4.1	6	24	66	2	M25204100
4.2	6	24	66	2	M25204200
4.3	6	24	66	2	M25204300
4.4	6	24	66	2	M25204400
4.5	6	24	66	2	M25204500
4.6	6	24	66	2	M25204600
4.7	6	24	66	2	M25204700
4.8	6	28	66	2	M25204800
4.9	6	28	66	2	M25204900
5	6	28	66	2	M25205000
5.1	6	28	66	2	M25205100
5.2	6	28	66	2	M25205200
5.3	6	28	66	2	M25205300
5.4	6	28	66	2	M25205400
5.5	6	28	66	2	M25205500
5.6	6	28	66	2	M25205600
5.7	6	28	66	2	M25205700
5.8	6	28	66	2	M25205800
5.9	6	28	66	2	M25205900
6	6	28	66	2	M25206000
6.1	8	34	79	2	M25206100
6.2	8	34	79	2	M25206200
6.3	8	34	79	2	M25206300
6.4	8	34	79	2	M25206400
6.5	8	34	79	2	M25206500
6.6	8	34	79	2	M25206600
6.7	8	34	79	2	M25206700
6.8	8	34	79	2	M25206800
6.9	8	34	79	2	M25206900
7	8	34	79	2	M25207000
7.1	8	41	79	2	M25207100
7.2	8	41	79	2	M25207200
7.3	8	41	79	2	M25207300
7.4	8	41	79	2	M25207400
7.5	8	41	79	2	M25207500
7.6	8	41	79	2	M25207600
7.7	8	41	79	2	M25207700
7.8	8	41	79	2	M25207800
7.9	8	41	79	2	M25207900
8	8	41	79	2	M25208000
8.1	10	47	89	2	M25208100
8.2	10	47	89	2	M25208200
8.3	10	47	89	2	M25208300
8.4	10	47	89	2	M25208400
8.5	10	47	89	2	M25208500
8.6	10	47	89	2	M25208600

\* TiN coating upon request

for Drilling Depth of 3XD

**HIGH PERFORMANCE SHORT DRILL | INTERNAL COOLANT |  
POINT 140°  
LIST M252**

D(m7)	d	L.O.C	O.A.L	Z	ITEM No.
8.7	10	47	89	2	M25208700
8.8	10	47	89	2	M25208800
8.9	10	47	89	2	M25208900
9	10	47	89	2	M25209000
9.1	10	47	89	2	M25209100
9.2	10	47	89	2	M25209200
9.3	10	47	89	2	M25209300
9.4	10	47	89	2	M25209400
9.5	10	47	89	2	M25209500
9.6	10	47	89	2	M25209600
9.7	10	47	89	2	M25209700
9.8	10	47	89	2	M25209800
9.9	10	47	89	2	M25209900
10	10	47	89	2	M25210000
10.1	12	55	102	2	M25210100
10.2	12	55	102	2	M25210200
10.3	12	55	102	2	M25210300
10.4	12	55	102	2	M25210400
10.5	12	55	102	2	M25210500
10.6	12	55	102	2	M25210600
10.7	12	55	102	2	M25210700
10.8	12	55	102	2	M25210800
10.9	12	55	102	2	M25210900
11	12	55	102	2	M25211000
11.1	12	55	102	2	M25211100
11.2	12	55	102	2	M25211200
11.3	12	55	102	2	M25211300
11.4	12	55	102	2	M25211400
11.5	12	55	102	2	M25211500
11.6	12	55	102	2	M25211600
11.7	12	55	102	2	M25211700
11.8	12	55	102	2	M25211800
11.9	12	55	102	2	M25211900
12	12	55	102	2	M25212000
12.5	14	60	107	2	M25212500
13	14	60	107	2	*M25213000
13.5	14	60	107	2	*M25213500
14	14	60	107	2	*M25214000
14.5	16	65	115	2	*M25214500
15	16	65	115	2	*M25215000
15.5	16	65	115	2	*M25215500
16	16	65	115	2	*M25216000
16.5	18	73	123	2	*M25216500
17	18	73	123	2	*M25217000
17.5	18	73	123	2	*M25217500
18	18	73	123	2	*M25218000
18.5	20	79	131	2	*M25218500
19	20	79	131	2	*M25219000
19.5	20	79	131	2	*M25219500
20	20	79	131	2	*M25220000

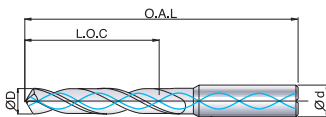
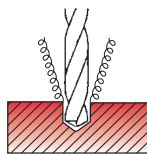
\* Non stock items available upon request

CARBIDE  
DRILLS

# → CARBIDE DRILLS |

## HIGH PERFORMANCE LONG DRILL | INTERNAL COOLANT | POINT 140° LIST M262

for Drilling Depth of 5XD



D(m7)	d	L.O.C	O.A.L	Z	ITEM No.
3	6	28	66	2	M26203000
3.1	6	28	66	2	M26203100
3.2	6	28	66	2	M26203200
3.3	6	28	66	2	M26203300
3.4	6	28	66	2	M26203400
3.5	6	28	66	2	M26203500
3.6	6	28	66	2	M26203600
3.7	6	28	66	2	M26203700
3.8	6	36	74	2	M26203800
3.9	6	36	74	2	M26203900
4	6	36	74	2	M26204000
4.1	6	36	74	2	M26204100
4.2	6	36	74	2	M26204200
4.3	6	36	74	2	M26204300
4.4	6	36	74	2	M26204400
4.5	6	36	74	2	M26204500
4.6	6	36	74	2	M26204600
4.7	6	36	74	2	M26204700
4.8	6	44	82	2	M26204800
4.9	6	44	82	2	M26204900
5	6	44	82	2	M26205000
5.1	6	44	82	2	M26205100
5.2	6	44	82	2	M26205200
5.3	6	44	82	2	M26205300
5.4	6	44	82	2	M26205400
5.5	6	44	82	2	M26205500
5.6	6	44	82	2	M26205600
5.7	6	44	82	2	M26205700
5.8	6	44	82	2	M26205800
5.9	6	44	82	2	M26205900
6	6	44	82	2	M26206000
6.1	8	53	91	2	M26206100
6.2	8	53	91	2	M26206200
6.3	8	53	91	2	M26206300
6.4	8	53	91	2	M26206400
6.5	8	53	91	2	M26206500
6.6	8	53	91	2	M26206600
6.7	8	53	91	2	M26206700
6.8	8	53	91	2	M26206800
6.9	8	53	91	2	M26206900
7	8	53	91	2	M26207000
7.1	8	53	91	2	M26207100
7.2	8	53	91	2	M26207200
7.3	8	53	91	2	M26207300
7.4	8	53	91	2	M26207400
7.5	8	53	91	2	M26207500
7.6	8	53	91	2	M26207600
7.7	8	53	91	2	M26207700
7.8	8	53	91	2	M26207800
7.9	8	53	91	2	M26207900
8	8	53	91	2	M26208000
8.1	10	61	103	2	M26208100
8.2	10	61	103	2	M26208200
8.3	10	61	103	2	M26208300
8.4	10	61	103	2	M26208400
8.5	10	61	103	2	M26208500
8.6	10	61	103	2	M26208600

\* TiN coating upon request

for Drilling Depth of 5XD

**HIGH PERFORMANCE LONG DRILL | INTERNAL COOLANT |  
POINT 140°  
LIST M262**

D(m7)	d	L.O.C	O.A.L	Z	ITEM No.
8.7	10	61	103	2	M26208700
8.8	10	61	103	2	M26208800
8.9	10	61	103	2	M26208900
9	10	61	103	2	M26209000
9.1	10	61	103	2	M26209100
9.2	10	61	103	2	M26209200
9.3	10	61	103	2	M26209300
9.4	10	61	103	2	M26209400
9.5	10	61	103	2	M26209500
9.6	10	61	103	2	M26209600
9.7	10	61	103	2	M26209700
9.8	10	61	103	2	M26209800
9.9	10	61	103	2	M26209900
10	10	61	103	2	M26210000
10.1	12	71	118	2	M26210100
10.2	12	71	118	2	M26210200
10.3	12	71	118	2	M26210300
10.4	12	71	118	2	M26210400
10.5	12	71	118	2	M26210500
10.6	12	71	118	2	M26210600
10.7	12	71	118	2	M26210700
10.8	12	71	118	2	M26210800
10.9	12	71	118	2	M26210900
11	12	71	118	2	M26211000
11.1	12	71	118	2	M26211100
11.2	12	71	118	2	M26211200
11.3	12	71	118	2	M26211300
11.4	12	71	118	2	M26211400
11.5	12	71	118	2	M26211500
11.6	12	71	118	2	M26211600
11.7	12	71	118	2	M26211700
11.8	12	71	118	2	M26211800
11.9	12	71	118	2	M26211900
12	12	71	118	2	M26212000
12.5	14	77	124	2	M26212500
13	14	77	124	2	*M26213000
13.5	14	77	124	2	*M26213500
14	14	77	124	2	*M26214000
14.5	16	83	133	2	*M26214500
15	16	83	133	2	*M26215000
15.5	16	83	133	2	*M26215500
16	16	83	133	2	*M26216000
16.5	18	93	143	2	*M26216500
17	18	93	143	2	*M26217000
17.5	18	93	143	2	*M26217500
18	18	93	143	2	*M26218000
18.5	20	101	153	2	*M26218500
19	20	101	153	2	*M26219000
19.5	20	101	153	2	*M26219500
20	20	101	153	2	*M26220000

\* Non stock items available upon request

**CARBIDE  
DRILLS**

# → CARBIDE DRILLS |

## RECOMMENDED WORKING DETAILS

### FORMULAS

**Cutting Speed**  $V_c = \frac{D \times \pi \times n}{1000}$  (m/min)

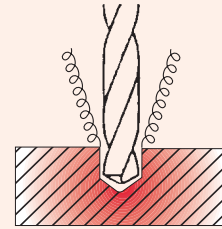
**Spindle Speed**  $n = \frac{V_c \times 1000}{\pi \times d}$  (1/min)

**Feed per Tooth**  $f_z = \frac{V_f}{n}$  (mm)

**Table Feed**  $V_f = f_z \times n$  (mm/min)

### Formula Symbols:

<b>D</b> (mm)	Tool diameter
<b>z</b>	No. of Flutes
<b>V<sub>c</sub></b> (m/min)	Cutting Speed
<b>F<sub>z</sub></b> (mm)	Feed per Tooth
<b>n</b> (1/min)	Spindle Speed
<b>V<sub>f</sub></b> (mm/min)	Table Feed
<b>π</b>	3.1416



DRILLING

## LISTS M152 / M155 / M162 / M252 / M262 |

Material	Rockwell Hardness	Lists	Vc- Cutting Speed		fz-feed per revolution in mm								
			m/min	m/min	D - diameter in mm								
	HRC		TICN	TIAlN	3	5	8	10	12	16	18	20	
Steel	<30HRc	M152	70~90	70~100	0.07~0.11	0.1~0.16	0.16~0.22	0.21~0.25	0.24~0.27	0.25~0.27	0.26~0.28	0.27~0.30	
		M252	70~90	90~100	0.07~0.12	0.12~0.18	0.17~0.23	0.22~0.27	0.26~0.28	0.26~0.30	0.26~0.30	0.27~0.30	
		M162/M262		90~100	0.05~0.09	0.08~0.13	0.012~0.16	0.15~0.2	0.18~0.2	0.18~0.2	0.18~0.2	0.18~0.2	
	30<HRc<40HRc	M152			40~70	0.06~0.10	0.08~0.13	0.10~0.16	0.17~0.20	0.18~0.24	0.22~0.27	0.26~0.28	0.28~0.30
		M252			50~70	0.06~0.12	0.08~0.14	0.10~0.17	0.17~0.22	0.18~0.25	0.22~0.28	0.26~0.29	0.28~0.30
		M162/M262			50~70	0.04~0.08	0.05~0.1	0.07~0.12	0.1~0.15	0.12~0.15	0.14~0.2	0.18~0.2	0.18~0.2
	40<HRc<50HRc	M152			25~40	0.05~0.09	0.09~0.11	0.11~0.15	0.13~0.16	0.14~0.17	0.15~0.19	0.17~0.21	0.19~0.21
		M252			35~40	0.05~0.10	0.09~0.12	0.11~0.16	0.13~0.17	0.14~0.18	0.15~0.20	0.17~0.22	0.19~0.22
		M162/M262			35~40	0.04~0.08	0.06~0.1	0.08~0.11	0.1~0.13	0.11~0.14	0.11~0.16	0.14~0.2	0.15~0.2
	50<HRc<57	M152/M162			10~35	0.03~0.07	0.05~0.08	0.07~0.10	0.09~0.11	0.09~0.12	0.10~0.13	0.10~0.15	0.12~0.15
		M252/M262			10~35	0.03~0.08	0.05~0.09	0.07~0.11	0.09~0.12	0.09~0.13	0.10~0.13	0.10~0.15	0.12~0.15
	50<HRc<57	M155			15~45	0.05~0.1	0.07~0.12	0.08~0.13	0.09~0.15	0.1~0.16	0.11~0.16	0.12~0.17	0.12~0.18
55<HRc<60	M155			10~35	0.03~0.07	0.05~0.08	0.07~0.10	0.09~0.11	0.09~0.12	0.10~0.13	0.10~0.15	0.12~0.15	
>60HRc	M155			7~12	0.02~0.05	0.04~0.06	0.04~0.06	0.04~0.06	0.04~0.06	0.04~0.06	0.04~0.06	0.04~0.06	
Stainless steels 4XX		M252	50~60	50~60	0.05~0.06	0.07~0.08	0.10~0.13	0.12~0.17	0.10~0.16	0.11~0.21	0.11~0.22	0.12~0.21	
Stainless steels 3XX		M252	40~50	40~50	0.04~0.06	0.06~0.08	0.09~0.12	0.10~0.15	0.11~0.16	0.11~0.16	0.11~0.17	0.13~0.20	
		M162/M262	40~50	40~50	0.03~0.05	0.04~0.08	0.05~0.1	0.08~0.13	0.09~0.13	0.09~0.13	0.09~0.17	0.09~0.18	
Titanium		M252/M262		40~45	0.02~0.04	0.04~0.05	0.06~0.9	0.09~0.11	0.10~0.11	0.12~0.14	0.14~0.14	0.15~0.19	
High Temperature Alloys (Inconel)		M252/M262		10~15	0.02~0.04	0.04~0.06	0.06~0.10	0.09~0.12	0.10~0.12	0.12~0.13	0.14~0.15	0.15~0.20	

### NOTE

Data shown is the result of actual machining tests and is suggested as a starting point. Do sensitivity analyses to achieve optimum results. The tests were run on an optimal machining environment.



---

## → SPECIAL TOOLS |



The Department for Special Tools at Hanita Metal Works, is entirely dedicated to the design and manufacturing of special milling solutions for high demanding operations and focused manufacturing.

Unique advantages such as in-house PVD high quality coating facilities (TiN, TiCN, TiAlN, AlTiN and Z-coat), a wide range of raw materials (HSS, HSSE, HSS-Powder; Solid Carbide) and capabilities for a wide range of diameters (0.3mm to 100mm) places Hanita as the preferred solution for high quality and specific application special tools.

Among other tools, we specialize in making: End Mills, Drills, Step Drills, Routers, Reamers, Counterbores, Tapered Tools, Threading Cutters.



SPECIALS

➔ SPECIALS |

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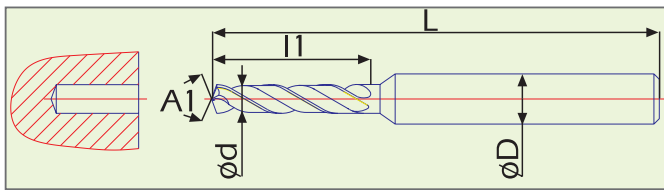




SPECIALS

# ➔ SPECIALS I

## SOLID STEP DRILL



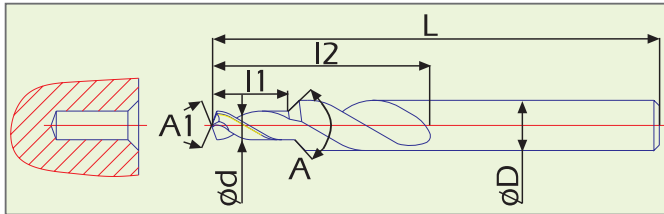
MARK TYPE

od : .....

l1 : .....

A° : .....

ød1 : .....



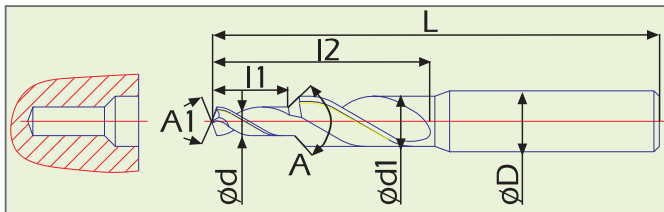

l2 : .....

A1° : .....

ød2 : .....

A2° : .....

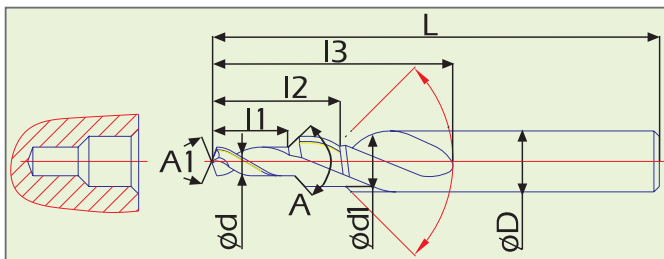
øD : .....




l3 : .....

L : .....

No of flute : .....



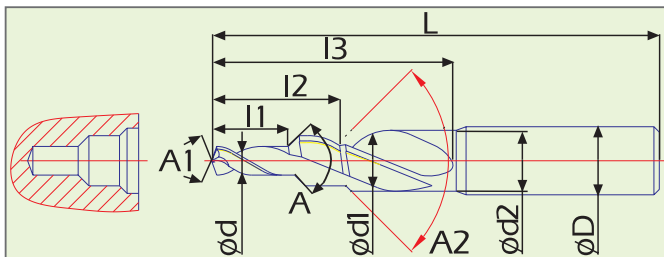

HELIX : .....

Material to be cut : .....

Coating : .....

Coolant holes : Yes  No

Quantities, pcs : .....




PRINT OR DRAWING ENCLOSED

Notes : .....

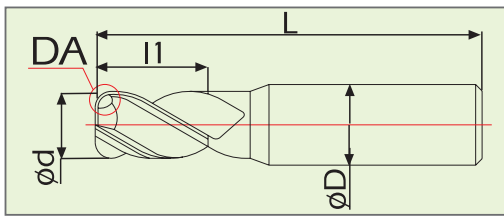
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.....

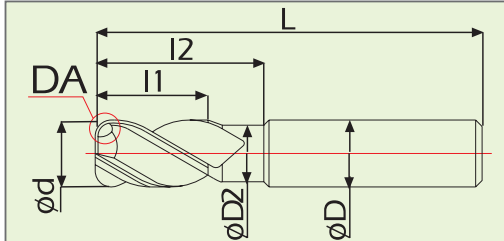
Other form and special tools are available upon request.

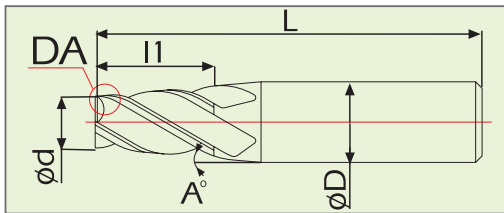


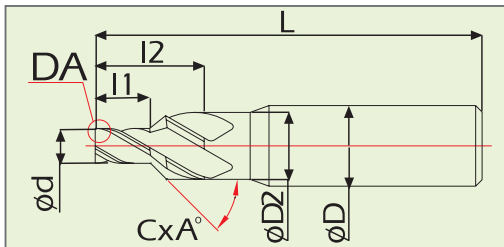
# END MILL

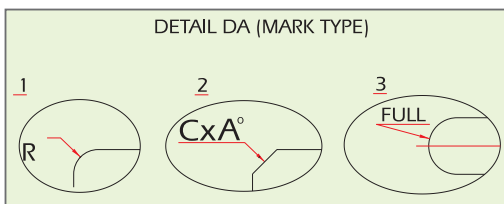


MARK TYPE










ød : -----

I1 : -----

A° : -----

L2 : -----

CXA° : -----

øD : -----

øD2 : -----

L : -----

No of flute : -----

HELIX : ----- RH  LH

CUTTING : RH  LH

TOOL MATERIAL : HSS ----- S.CARBIDE -----

TOOL TYPE : FINISHER  ROUGHER

Coolant Holes : Yes  No

Coating : -----

HANITA LIST : -----

Material to be cut : -----

Quantities, pcs : -----

PRINT OR DRAWING ENCLOSED

Notes : -----

-----

-----

-----

Other form and special tools are available upon request.



SPECIALS

# → ORDER GUIDE |

## To order follow these 3 easy steps

1. Identify the relevant List

**EXAMPLE**

**LIST 1600**

2. Choose the **ITEM No.** in the category

3. And finally add the suffix code from one of the suffix categories:  
**Uncoated, TiN, Z-Coat, TiCN, TiAIN, AITiN.**

**EXAMPLE**

**Hanita Ordering No.**

(11 digits)

| List No. |

**160003002WW**

| Item No. | Suffix |

## The suffix categories

### The suffix categories:

<b>Uncoated</b>	•• . . . Plain Shank Uncoated
<b>AA</b>	. . . Weldon Shank Type A Uncoated
<b>BB</b>	. . . Weldon Shank Type B Uncoated
<b>FF</b>	. . . Screwed Shank Uncoated
<b>JJ</b>	. . . Japanese Standard, Plain Shank Uncoated
<b>WW</b>	. . . Weldon Shank Uncoated
<b>TiN</b>	<b>TA</b> . . . TiN Coated Weldon Shank Type A
	<b>TB</b> . . . TiN Coated Weldon Shank Type B
	<b>TF</b> . . . TiN Coated Screwed Shank
	<b>TJ</b> . . . TiN Coated Japanese Standard Plain Shank
	<b>TN</b> . . . TiN Coated Whistle Notch Shank
	<b>TT</b> . . . TiN Coated Plain Shank
	<b>TW</b> . . . TiN Coated Weldon Shank
<b>Z-Coat</b>	<b>ZF</b> . . . Z-Coat Coated Screwed Shank
	<b>ZJ</b> . . . Z-Coat Coated Japanese Standard Plain Shank
	<b>ZT</b> . . . Z-Coat Coated Plain Shank
	<b>ZW</b> . . . Z-Coat Coated Weldon Shank
<b>TiCN</b>	<b>CA</b> . . . TiCN Coated Weldon Shank Type A
	<b>CB</b> . . . TiCN Coated Weldon Shank Type B
	<b>CF</b> . . . TiCN Coated Screwed Shank
	<b>CJ</b> . . . TiCN Coated Japanese Standard Plain Shank
	<b>CN</b> . . . TiCN Coated Whistle Notch Shank
	<b>CT</b> . . . TiCN Coated Plain Shank
	<b>CW</b> . . . TiCN Coated Weldon Shank
<b>TiAIN</b>	<b>LF</b> . . . TiAIN Coated Screwed Shank
	<b>LJ</b> . . . TiAIN Coated Japanese Standard Plain Shank
	<b>LT</b> . . . TiAIN Coated Plain Shank
	<b>LW</b> . . . TiAIN Coated Weldon Shank
	<b>RJ</b> . . . TiAIN Coated Japanese Standard Plain Shank
	<b>RN</b> . . . TiAIN Coated Whistle Notch Shank
	<b>RT</b> . . . TiAIN Coated Plain Shank
	<b>RW</b> . . . TiAIN Coated Weldon Shank
<b>AITiN</b>	<b>MT</b> . . . AITiN Coated Plain Shank

# → GUIDE TO TOOL SPECIFICATIONS |

**Machine Material** → **NF** (NON FERROUS) | **AL** (ALUMINIUM) | **AISI** (HIGH SILICON ALUMINIUM) | **St S** (STAINLESS STEEL) | **Ti** (TITANIUM) | **INCONEL** | **GRAPHITE** | **30>ST HRc** (SOFT STEELS) | **30<45 HRc** (MEDIUM HARD STEELS) | **ST>45 HRc** (HARDENED STEELS) | **GENERAL PURPOSE**

**Pitch** → **NEW GENERATION CHAMFERED PITCH** | **NEW GENERATION FLAT SHALLOW PITCH** | **NEW GENERATION CHIP BREAKER PITCH** | **CONVENTIONAL COARSE PITCH** | **CONVENTIONAL FINE PITCH** | **CONVENTIONAL EXTRA FINE PITCH** | **TYPE-D** | **TYPE-O** | **TYPE-V** | **TYPE-VI**

**Shank** → **PLAIN** | **WELDON** | **SCREWED** | **WHISTLE NOTCH**

**Materials** → **PREMIUM CARBIDE** | **CARBIDE** | **HSS-M42** | **HSS-PM**

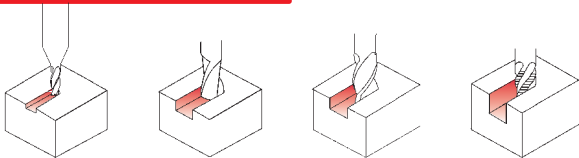
**Corner Radius** → **Corner Radius**

**Helix Angle** → **35°**

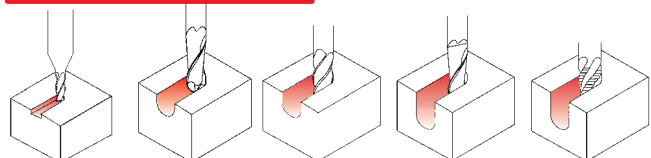
**Standard** → **HANITA Standard** (HANITA) | **DIN Standard** (DIN) | **JIS Standard** (JAPANESE)

# → GUIDE TO TOOLS APPLICATIONS |

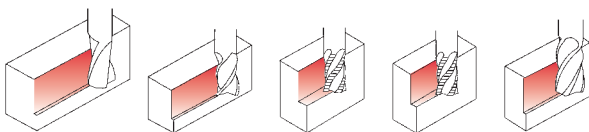
## Slotting-Square End



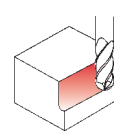
## Slotting Ball Nose



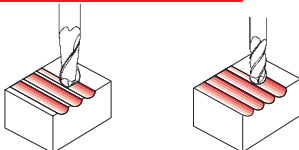
## Side Milling-Square End



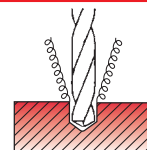
## Side Milling-Ball Nose



## Profiling-Ball nose



## Drilling





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