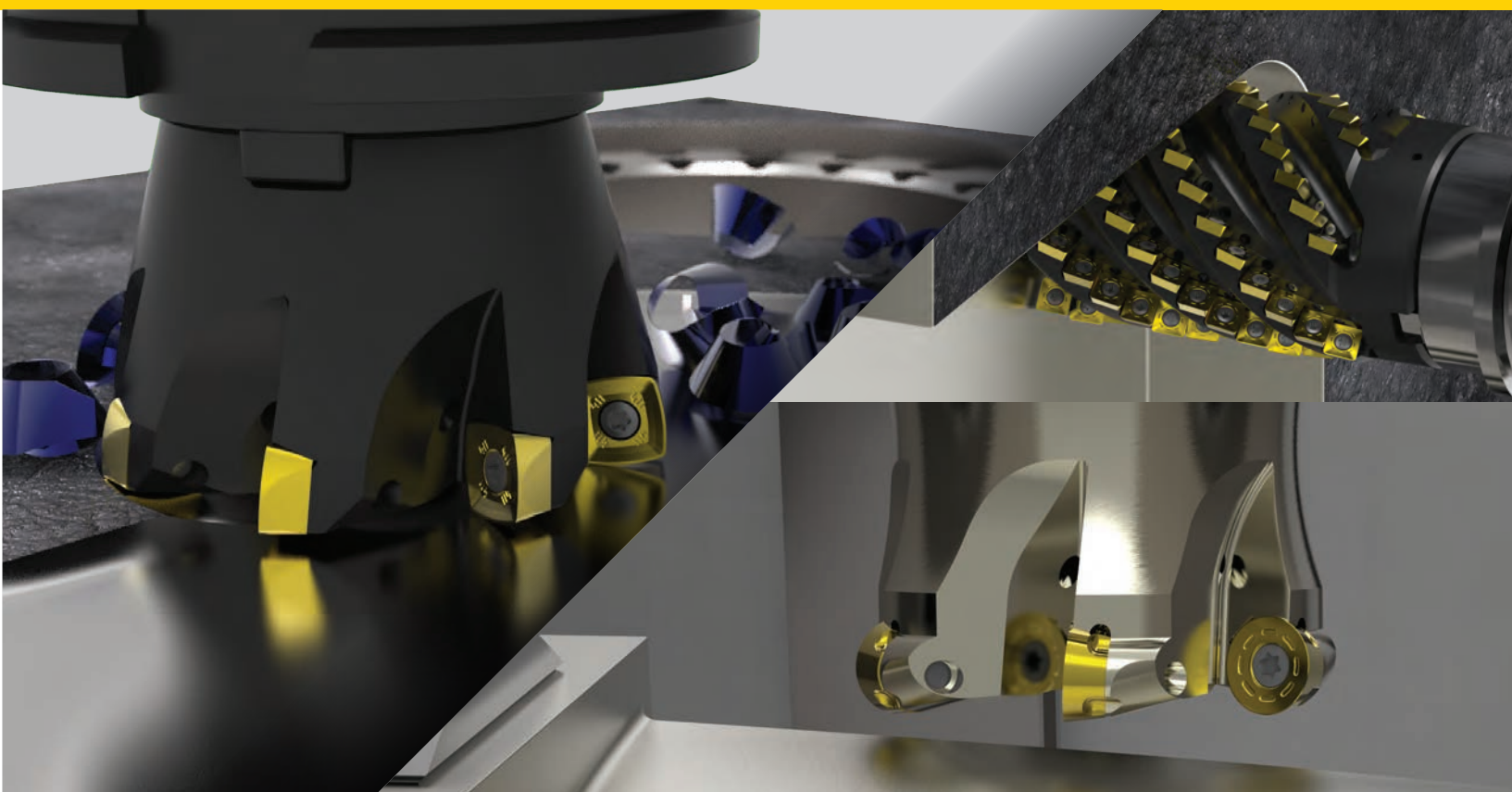




CUTTING TOOLS

Stellram® Cutting Tools



HIGH PERFORMANCE MILLING SOLUTIONS





Patented Breakthroughs for Difficult to Machine Materials: Cut Faster. Cut Longer. Cut More Profitably.

These Kennametal Milling Systems are specifically designed and manufactured for machining high performance, difficult-to-machine materials.

This capability was developed after years of advanced R&D in materials science and machining Titanium and Titanium Alloys, Nickel Alloys and Superalloys, Stainless Steel and Specialty Alloys, and Hard Materials.

The result: These proven “Best in Class” machining solutions presented in this brochure.

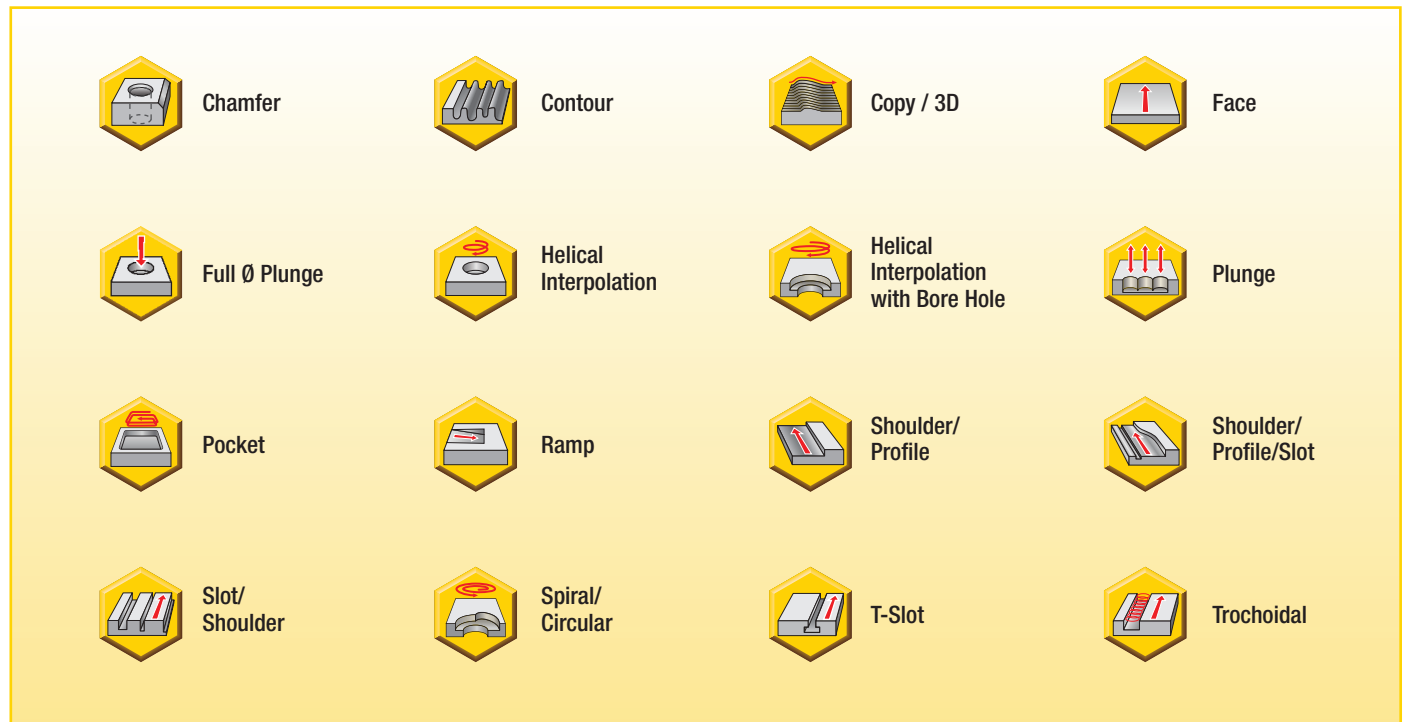
Our strategy is to bring “game changing” cutting tool solutions that deliver industry leading metal removal rates. Higher metal removal rates mean you increase capacity, make more profit and deliver in shorter lead times.

Stellram® high performance cutting tools are known for cutting titanium like butter and have found wide application in the aerospace, defense, power generation, oil and gas, medical, transportation and construction and mining industries.

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Application Guide



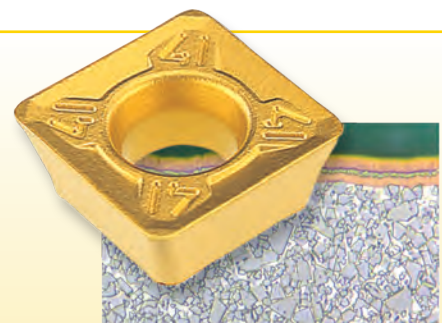
Patented X-Grade Insert Technology

3-TIMES THE METAL REMOVAL RATE

Titanium and Nickel Based Alloys are some of the toughest machining jobs on earth.

And it is a rare element, a member of the platinum family, called Ruthenium, that is one of the key ingredients used in our patented X-Grade™ Technology cutting tools.

We combine Ruthenium with Cobalt to form an exclusive binder that cements our engineered carbide formulas in the making of these inserts.



X-Grade Inserts provide unmatched performance in cutting difficult to machine materials.



7792 High Feed Milling

- Patented Cutter Designs
- Patented Insert Designs
- Patented Grades

**To remove the highest volume of metal
in the shortest possible time**



7792: Increase Metal Removal Rate up to 90% or More!

Modular

0.625" – 1.500"



- Cutting diameters from 0.625" to 6.300"
- Modular, Weldon, Cylindrical and Shell Mill configurations
- Modular Tungsten Extensions maintain stability in deep pocket applications
- All inserts feature 4 cutting edges

Weldon

1.000" – 1.250"



The Patented 7792 Insert



The unique 7792 insert design provides outstanding operational security and performance, with enhanced metal removal capability.

Cylindrical

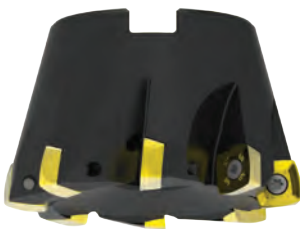
0.625" – 1.500"



- Maximize tool life, versatility and performance
- Face, Pocket, Shoulder, Profile, Helical Interpolate, Ramp, Copy and Mill Turn with one tool
- 6 grades for materials from Aluminum to Superalloys
- 4 insert sizes available
- Depth of cut from 0.035" to 0.138"
- Coarse, medium and fine pitch cutters available for all machining conditions.

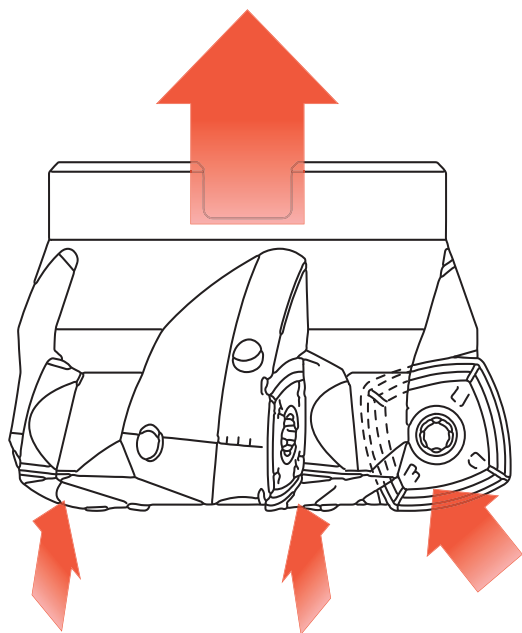
Shell

1.500" – 6.300"



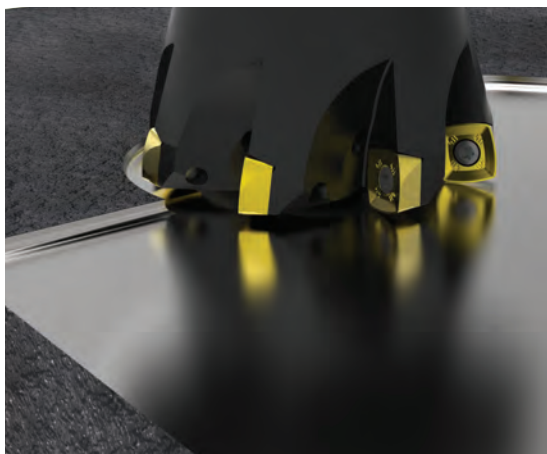


How High Feed Cutters Work



The patented design of High Feed Cutters and Inserts combine to drive the cutting forces axially into the spindle. This allows even less rigid machines to outperform newer machines with conventional cutters by taking high feed, shallow cuts.

- 5 times the feed rate of conventional face mills
- High feed, shallow cuts
- Dramatically reduced cycle times
- Reduced vibration
- Better quality parts in less than half the time
- Twice the tool life or more



Hard Case: The Ti Alpha Barrier

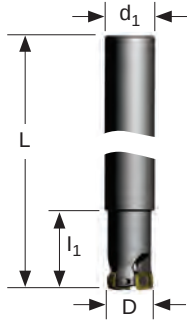
The Alpha Casing, which forms during the cooling of the Titanium billet and varies in thickness and hardness, creates nearly impossible machining conditions. The previous most cost effective solution was to chemically remove it with acid.

An aerospace customer was using our X-Grade inserts with our top performing button cutter on several titanium applications. This was our benchmark to test the 7792.

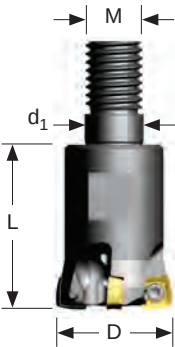
Here's how the 7792VXD12 with X-500 Grade inserts performed on a Ti 6-4 Alpha Case ...

- 24% less energy consumed
- 120% increase in material removal rate
- Nearly 3 times the tool life

The 7792 eliminated the need for highly toxic, dangerous chemicals and made effective Alpha Case machining a production reality.



Cylindrical Shank



Modular Head

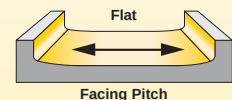
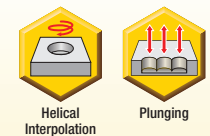
Product		Dimensions (inch)						Spares				
EDP	Item Description	D	L/H	l ₁	d ₁	a _p max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.
7792VXP06 Cylindrical Shank												
031643	C7792VXP06CA.62Z2R5.5	0.625	7.420	0.980	0.625	0.035	2	031449	FP2506T	031452	TP7	8.90
031620	C7792VXP06CA.75Z3R6.1	0.750	8.090	1.260	0.750	0.035	3	031449	FP2506T	031452	TP7	8.90
031621	C7792VXP06CA1.0Z4R6.1	1.000	8.340	1.575	1.000	0.035	4	031450	FP2507T	031452	TP7	8.90
031622	C7792VXP06CA1.25Z5R8	1.250	9.760	1.575	1.250	0.035	5	031450	FP2507T	031452	TP7	8.90

Product		Dimensions (inch)						Spares				
EDP	Item Description	D	L/H	M	d ₁	a _p max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.
7792VXP06 Modular Head - Medium and Fine Pitch												
031623	A7792VXP06SA.625Z2R1	0.625	1.000	M8	0.335	0.035	2	031449	FP2506T	031452	TP7	8.90
031624	A7792VXP06SA.75Z2R1.4	0.750	1.377	M10	0.413	0.035	2	031449	FP2506T	031452	TP7	8.90
031625	A7792VXP06SA.75Z3R1.4	0.750	1.377	M10	0.413	0.035	3	031449	FP2506T	031452	TP7	8.90
031626	A7792VXP06SA1.0Z3R1.4	1.000	1.377	M12	0.492	0.035	3	031450	FP2507T	031452	TP7	8.90
031627	A7792VXP06SA1.0Z4R1.4	1.000	1.377	M12	0.492	0.035	4	031450	FP2507T	031452	TP7	8.90
031628	A7792VXP06SA1.25Z5R2	1.250	1.693	M16	0.669	0.035	5	031450	FP2507T	031452	TP7	8.90

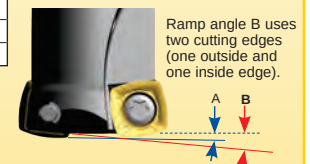
Note: For cylindrical shank extensions in high density alloy with through coolant refer to page 45.

7792VXP06 Technical Information (inch)

Product		Dimensions							Max RPM
EDP	Item Description	Facing Pitch	Ramping Angle		Helical Hole min. - max.		a _p max Helical / Linear	a _e max Plunging	
			A °	B °					
031643	C7792VXP06CA.62Z2R5.5	0.255	6.09	8.20	0.850	1.170	0.023	0.118	65,000
031620	C7792VXP06CA.75Z3R6.1	0.380	3.86	6.74	1.100	1.420	0.023	0.118	57,000
031621	C7792VXP06CA1.0Z4R6.1	0.630	2.11	4.34	1.600	1.920	0.023	0.118	49,000
031622	C7792VXP06CA1.25Z5R8	0.880	1.43	2.69	2.100	2.420	0.023	0.118	41,500
031623	A7792VXP06SA.625Z2R1	0.255	6.09	8.20	0.850	1.170	0.023	0.118	65,000
031624	A7792VXP06SA.75Z2R1.4	0.380	3.86	6.74	1.100	1.420	0.023	0.118	57,000
031625	A7792VXP06SA.75Z3R1.4	0.380	3.86	6.74	1.100	1.420	0.023	0.118	57,000
031626	A7792VXP06SA1.0Z3R1.4	0.630	2.11	4.34	1.600	1.920	0.023	0.118	49,000
031627	A7792VXP06SA1.0Z4R1.4	0.630	2.11	4.34	1.600	1.920	0.023	0.118	49,000
031628	A7792VXP06SA1.25Z5R2	0.880	1.43	2.69	2.100	2.420	0.023	0.118	41,500



Ramp angle A uses one outside cutting edge only.



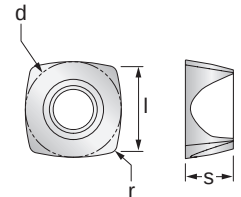
A = max ramp angle utilizing full face contact
B = max ramp angle utilizing full contact + internal corner radius



Depth of Cut (a_p)



XPLT06-D41



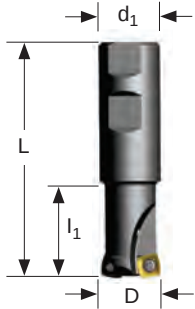
Product			Application & Material			Dimensions (inch)				
EDP	Item Description	Grade	Facing	Slotting	Plunging	d (IC)	l	s	r	h _m min
			Depth of Cut (inch)							
			a _p max. 0.035	a _p max. 0.035	a _e max. 0.118					
030403	XPLT060308ER-D41	X400				0.276	0.276	0.125	0.031	0.002
030402	XPLT060308ER-D41	X500				0.276	0.276	0.125	0.031	0.002
031538	XPLT060308ER-D41	SP6519				0.276	0.276	0.125	0.031	0.002
033066	XPLT060308ER-D41	SC6525				0.276	0.276	0.125	0.031	0.002

Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 19.

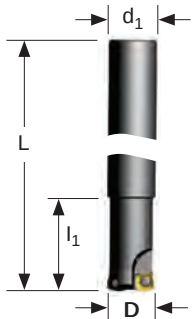
7792VXP06 Feeds f _z (inch/tooth)																	
Geometry	Grade	Operation	Unalloyed Steel	Alloyed Steel	Stainless Steel	Stainless Steel Refractory PH	Gray Iron	Spheroidal-Ductile Iron	Malleable Iron	Aluminum & Alloys <16% Si 116 HBN	Aluminum & Silicon >16% Si 92 HBN	HTA Iron Based Alloys	HTA Cobalt Based Alloys	HTA Nickel Based Alloys	HTA Titanium Based Alloys	Hard Steel >1400 N/mm ² >415 HBN	Chilled Cast Iron >1400 N/mm ² >400 HBN
			Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.
ER-D41	X400	Facing	0.008 - 0.043	0.008 - 0.035	-	-	-	-	-	-	-	-	-	-	-	0.008 - 0.024	0.008 - 0.024
ER-D41	X400	Slotting	0.008 - 0.035	0.008 - 0.031	-	-	-	-	-	-	-	-	-	-	-	0.008 - 0.020	0.008 - 0.020
ER-D41	X400	Plunging	0.002 - 0.012	0.002 - 0.008	-	-	-	-	-	-	-	-	-	-	-	0.002 - 0.003	0.002 - 0.003
ER-D41	X500	Facing	-	-	0.006 - 0.039	0.006 - 0.035	-	-	-	-	-	0.006 - 0.020	0.006 - 0.020	0.006 - 0.020	0.006 - 0.024	-	-
ER-D41	X500	Slotting	-	-	0.006 - 0.031	0.006 - 0.030	-	-	-	-	-	0.004 - 0.016	0.004 - 0.016	0.004 - 0.016	0.004 - 0.018	-	-
ER-D41	X500	Plunging	-	-	0.002 - 0.008	0.002 - 0.006	-	-	-	-	-	0.002 - 0.002	0.002 - 0.002	0.002 - 0.002	0.002 - 0.002	-	-
ER-D41	SP6519	Facing	0.008 - 0.039	0.008 - 0.031	0.006 - 0.035	0.006 - 0.031	0.008 - 0.047	0.008 - 0.039	0.008 - 0.035	0.008 - 0.028	-	0.006 - 0.020	0.006 - 0.020	0.006 - 0.020	0.006 - 0.024	-	-
ER-D41	SP6519	Slotting	0.008 - 0.031	0.008 - 0.030	0.006 - 0.031	0.006 - 0.028	0.008 - 0.039	0.008 - 0.035	0.008 - 0.031	0.008 - 0.028	-	0.004 - 0.016	0.004 - 0.016	0.004 - 0.016	0.004 - 0.018	-	-
ER-D41	SP6519	Plunging	0.002 - 0.010	0.002 - 0.007	0.002 - 0.008	0.002 - 0.006	0.002 - 0.010	0.002 - 0.008	0.002 - 0.007	0.002 - 0.010	-	0.002 - 0.002	0.002 - 0.002	0.002 - 0.002	0.002 - 0.002	-	-
ER-D41	SC6525	Facing	0.006 - 0.039	0.006 - 0.031	-	-	0.008 - 0.047	0.008 - 0.039	-	-	-	-	-	-	-	-	-
ER-D41	SC6525	Slotting	0.006 - 0.030	0.006 - 0.027	-	-	0.008 - 0.039	0.008 - 0.035	-	-	-	-	-	-	-	-	-
ER-D41	SC6525	Plunging	0.002 - 0.008	0.002 - 0.006	-	-	0.002 - 0.010	0.002 - 0.008	-	-	-	-	-	-	-	-	-

Note: HTA = High Temperature Alloys

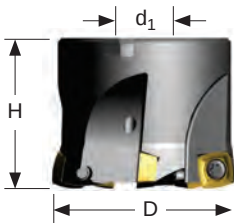
Note: Speed recommendations can be found on page 14.



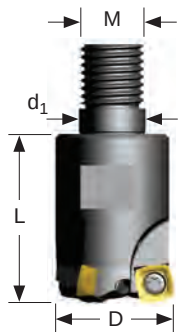
Weldon Shank



Cylindrical Shank



Shell Mill Fixation



Modular Head



Depth of Cut (ap)

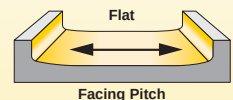
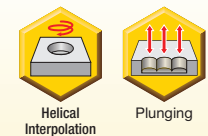
Product		Dimensions (inch)						Spares				
EDP	Item Description	D	L/H	l ₁	d ₁	ap max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.
7792VXD09 Weldon Shank												
029474	C7792VXD09WA1.00Z2R	1.000	3.855	1.574	1.000	0.059	2	015269	F3508T	015240	T15	18.60
029475	C7792VXD09WA1.25Z3R	1.250	3.855	1.574	1.250	0.059	3	015064	F3510T	015240	T15	18.60
7792VXD09 Cylindrical Shank												
031193	C7792VXD09CA1.00Z2R2	1.000	7.874	1.968	1.000	0.059	2	015269	F3508T	015240	T15	18.60
031194	C7792VXD09CA1.25Z3R3	1.250	9.842	2.755	1.250	0.059	3	015064	F3510T	015240	T15	18.60
7792VXD09 Shell Mill Fixation - Coarse, Medium and Fine Pitch												
029476	C7792VXD09-A1.50Z3R	1.500	1.260	-	0.500	0.059	3	015064	F3510T	015240	T15	18.60
029477	C7792VXD09-A1.50Z4R	1.500	1.260	-	0.500	0.059	4	015064	F3510T	015240	T15	18.60
030431	C7792VXD09-A1.50Z5R	1.500	1.260	-	0.500	0.059	5	015064	F3510T	015240	T15	18.60
030432	C7792VXD09-A2.00Z5R	2.000	1.574	-	0.750	0.059	5	015064	F3510T	015240	T15	18.60
030433	C7792VXD09-A2.00Z6R	2.000	1.574	-	0.750	0.059	6	015064	F3510T	015240	T15	18.60

Product		Dimensions (inch)						Spares				
EDP	Item Description	D	L/H	M	d ₁	ap max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.
7792VXD09 Modular Head												
030616	A7792VXD09SA1.0Z2R1.4	1.000	1.377	M12	0.492	0.059	2	015269	F3508T	015240	T15	18.60
030617	A7792VXD09SA1.25Z3R2	1.250	1.692	M16	0.669	0.059	3	015064	F3510T	015240	T15	18.60

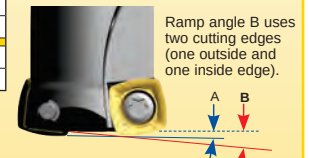
Note: For cylindrical shank extensions in high density alloy with through coolant refer to page 45.

7792VXD09 Technical Information (inch)

Product		Dimensions						
EDP	Item Description	Facing Pitch	Ramping Angle		Helical Hole min. - max.		ap max Helical / Linear	Max RPM
			A °	B °				
029474	C7792VXD09WA1.00Z2R	0.478	2.70	8.00	1.370	1.920	0.020	48,000
029475	C7792VXD09WA1.25Z3R	0.728	1.50	4.50	1.870	2.420	0.020	40,500
031193	C7792VXD09CA1.00Z2R2	0.478	2.70	8.00	1.370	1.920	0.020	48,000
031194	C7792VXD09CA1.25Z3R3	0.728	1.50	4.50	1.870	2.420	0.020	40,500
029476	C7792VXD09-A1.50Z3R	0.980	1.10	2.70	2.370	2.920	0.020	36,000
029477	C7792VXD09-A1.50Z4R	0.980	1.10	2.70	2.370	2.920	0.020	36,000
030431	C7792VXD09-A1.50Z5R	0.980	1.10	2.70	2.370	2.920	0.020	36,000
030432	C7792VXD09-A2.00Z5R	1.478	0.70	1.80	3.370	3.920	0.020	30,000
030433	C7792VXD09-A2.00Z6R	1.478	0.70	1.80	3.370	3.920	0.020	30,000
030616	A7792VXD09SA1.0Z2R1.4	0.480	2.70	8.10	1.370	1.920	0.020	48,000
030617	A7792VXD09SA1.25Z3R2	0.728	1.50	4.50	1.870	2.420	0.020	40,500

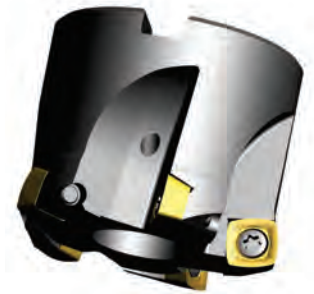
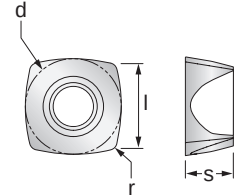


Ramp angle A uses one outside cutting edge only.



A = max ramp angle utilizing full face contact

B = max ramp angle utilizing full contact + internal corner radius



Product			Application & Material			Dimensions (inch)				
EDP	Item Description	Grade	Facing	Slotting	Plunging	d (IC)	l	s	r	h _m min
			Depth of Cut (inch)							
			a _p max. 0.059	a _p max. 0.059	a _e max. 0.236					
029487	XDLW090408SR-D	X400				0.375	0.375	0.187	0.031	0.004
029485	XDLW090408SR-D	X500				0.375	0.375	0.187	0.031	0.004
029486	XDLW090408SR-D	SC3025				0.375	0.375	0.187	0.031	0.004
029685	XDLT090408ER-D41	X500				0.375	0.375	0.187	0.031	0.002
031535	XDLT090408ER-D41	SP6519				0.375	0.375	0.187	0.031	0.002
033067	XDLT090408ER-D41	SC6525				0.375	0.375	0.187	0.031	0.002
029637	XDLT090408ER-D721	GH2				0.375	0.375	0.187	0.031	0.001
030853	XDLT090412ER-D411	X500				0.375	0.375	0.187	0.047	0.002
030854	XDLT090412ER-D411	SP6519				0.375	0.375	0.187	0.047	0.002

Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 19.

XDLW090408SR-D X500 should be used for Alloy Steel and Stainless Steel with heavy scale.

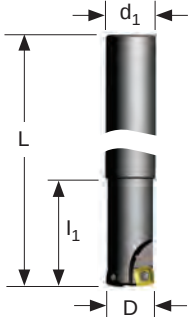
XDLT090412ER-D411 is a more positive geometry than the -D-41 with a larger radius which increases performance during smaller radial engagements or where chipping may occur when using the -D-41 geometry. XDLT090412ER-D411 uses less power than the -D-41 geometry.

7792VXD09 Feeds f_z (inch/tooth)

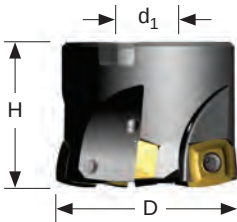
Geometry	Grade	Operation	Unalloyed Steel	Alloyed Steel	Stainless Steel	Stainless Steel Refractory PH	Gray Iron	Spheroidal-Ductile Iron	Malleable Iron	Aluminum & Alloys <16% Si 116 HBN	Aluminum & Silicon >16% Si 92 HBN	HTA Iron Based Alloys	HTA Cobalt Based Alloys	HTA Nickel Based Alloys	HTA Titanium Based Alloys	Hard Steel >1400 N/mm ² >415 HBN	Chilled Cast Iron >1400 N/mm ² >400 HBN
			Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.
SR-D	X400	Facing	0.012 - 0.079	0.012 - 0.079	-	-	-	-	-	-	-	-	-	-	-	0.012 - 0.032	0.012 - 0.039
SR-D	X400	Slotting	0.012 - 0.059	0.012 - 0.059	-	-	-	-	-	-	-	-	-	-	-	0.012 - 0.024	0.012 - 0.032
SR-D	X400	Plunging	0.004 - 0.010	0.004 - 0.008	-	-	-	-	-	-	-	-	-	-	-	0.004 - 0.005	0.004 - 0.005
SR-D	X500	Facing	-	0.012 - 0.079	0.012 - 0.097	0.012 - 0.090	-	-	-	-	-	-	-	-	-	-	-
SR-D	X500	Slotting	-	0.012 - 0.059	0.012 - 0.035	0.012 - 0.032	-	-	-	-	-	-	-	-	-	-	-
SR-D	X500	Plunging	-	0.004 - 0.008	0.004 - 0.008	0.004 - 0.006	-	-	-	-	-	-	-	-	-	-	-
SR-D	SC3025	Facing	-	-	-	-	0.012 - 0.079	0.012 - 0.071	0.012 - 0.059	-	-	-	-	-	-	-	-
SR-D	SC3025	Slotting	-	-	-	-	0.012 - 0.067	0.012 - 0.059	0.012 - 0.051	-	-	-	-	-	-	-	-
SR-D	SC3025	Plunging	-	-	-	-	0.004 - 0.010	0.004 - 0.009	0.004 - 0.008	-	-	-	-	-	-	-	-
ER-D41	X500	Facing	-	0.012 - 0.059	0.008 - 0.039	0.008 - 0.030	-	-	-	-	-	0.008 - 0.024	0.008 - 0.024	0.008 - 0.024	0.008 - 0.032	-	-
ER-D41	X500	Slotting	-	0.012 - 0.043	0.008 - 0.032	0.006 - 0.025	-	-	-	-	-	0.004 - 0.020	0.004 - 0.020	0.004 - 0.020	0.004 - 0.028	-	-
ER-D41	X500	Plunging	-	0.004 - 0.007	0.004 - 0.006	0.003 - 0.005	-	-	-	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.002 - 0.004	-	-
ER-D41	SP6519	Facing	0.012 - 0.059	0.012 - 0.051	0.008 - 0.039	0.008 - 0.024	0.012 - 0.059	0.012 - 0.051	-	-	-	0.008 - 0.024	0.008 - 0.024	0.008 - 0.024	0.008 - 0.032	-	-
ER-D41	SP6519	Slotting	0.012 - 0.051	0.012 - 0.039	0.008 - 0.032	0.006 - 0.020	0.012 - 0.051	0.012 - 0.039	-	-	-	0.004 - 0.020	0.004 - 0.020	0.004 - 0.020	0.004 - 0.028	-	-
ER-D41	SP6519	Plunging	0.004 - 0.008	0.004 - 0.006	0.004 - 0.006	0.002 - 0.003	0.004 - 0.008	0.004 - 0.006	-	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.002 - 0.004	-	-
ER-D41	SC6525	Facing	0.008 - 0.047	0.008 - 0.039	-	-	0.012 - 0.059	0.012 - 0.051	-	-	-	-	-	-	-	-	-
ER-D41	SC6525	Slotting	0.008 - 0.040	0.008 - 0.032	-	-	0.012 - 0.051	0.012 - 0.039	-	-	-	-	-	-	-	-	-
ER-D41	SC6525	Plunging	0.004 - 0.008	0.004 - 0.006	-	-	0.004 - 0.008	0.004 - 0.006	-	-	-	-	-	-	-	-	-
ER-D721	GH2	Facing	-	-	-	-	-	-	-	0.012 - 0.039	0.012 - 0.039	-	-	-	-	-	-
ER-D721	GH2	Slotting	-	-	-	-	-	-	-	0.012 - 0.039	0.012 - 0.039	-	-	-	-	-	-
ER-D721	GH2	Plunging	-	-	-	-	-	-	-	0.004 - 0.012	0.004 - 0.012	-	-	-	-	-	-
ER-D411	X500	Facing	-	-	0.008 - 0.039	0.008 - 0.032	-	-	-	-	-	0.008 - 0.024	0.008 - 0.024	0.008 - 0.024	0.008 - 0.032	-	-
ER-D411	X500	Slotting	-	-	0.008 - 0.032	0.006 - 0.028	-	-	-	-	-	0.004 - 0.020	0.004 - 0.020	0.004 - 0.020	0.004 - 0.028	-	-
ER-D411	X500	Plunging	-	-	0.004 - 0.006	0.003 - 0.005	-	-	-	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.002 - 0.004	-	-
ER-D411	SP6519	Facing	0.012 - 0.059	0.012 - 0.051	0.008 - 0.006	0.008 - 0.024	0.012 - 0.059	0.012 - 0.051	-	-	-	0.008 - 0.024	0.008 - 0.024	0.008 - 0.024	0.008 - 0.032	-	-
ER-D411	SP6519	Slotting	0.012 - 0.051	0.012 - 0.039	0.008 - 0.032	0.006 - 0.020	0.012 - 0.051	0.012 - 0.039	-	-	-	0.004 - 0.020	0.004 - 0.020	0.004 - 0.020	0.004 - 0.028	-	-
ER-D411	SP6519	Plunging	0.004 - 0.008	0.004 - 0.006	0.004 - 0.006	0.002 - 0.003	0.004 - 0.008	0.004 - 0.006	-	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.002 - 0.004	-	-

Note: HTA = High Temperature Alloys

Note: Speed recommendations can be found on page 14.



Cylindrical Shank



Shell Mill Fixation



Modular Head



Depth of Cut (ap)

Product		Dimensions (inch)						Spares				
EDP	Item Description	D	L/H	l ₁	d ₁	ap max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.
7792VXD12 Cylindrical Shank												
031196	C7792VXD12CA1.25Z2R3	1.250	9.842	2.755	1.250	0.098	2	015262	D4010T	015240	T15	27.40
033070	C7792VXD12CA1.2/1.5Z3R3	1.500	9.842	2.755	1.250	0.098	3	015262	D4010T	015240	T15	27.40

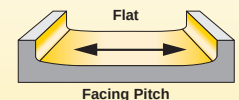
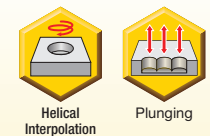
7792VXD12 Shell Mill Fixation - Coarse, Medium and Fine Pitch												
029480	C7792VXD12-A2.00Z3R	2.000	1.574	-	0.750	0.098	3	015263	D4012T	015240	T15	27.40
029481	C7792VXD12-A2.00Z4R	2.000	1.574	-	0.750	0.098	4	015263	D4012T	015240	T15	27.40
030485	C7792VXD12-A2.00Z5R	2.000	1.574	-	0.750	0.098	5	015262	D4010T	015240	T15	27.40
029482	C7792VXD12-A2.50Z4R	2.500	1.574	-	1.000	0.098	4	015263	D4012T	015240	T15	27.40
029483	C7792VXD12-A2.50Z5R	2.500	1.574	-	1.000	0.098	5	015263	D4012T	015240	T15	27.40
029484	C7792VXD12-A3.00Z5R	3.000	1.970	-	1.000	0.098	5	015263	D4012T	015240	T15	27.40
030486	C7792VXD12-A3.00Z8R	3.000	1.970	-	1.000	0.098	8	015263	D4012T	015240	T15	27.40
030437	C7792VXD12-A4.00Z6R	4.000	1.970	-	1.250	0.098	6	015263	D4012T	015240	T15	27.40
030438	C7792VXD12-A4.00Z9R	4.000	1.970	-	1.250	0.098	9	015263	D4012T	015240	T15	27.40
030439	C7792VXD12-A5.00Z8R	5.000	2.480	-	1.500	0.098	8	015263	D4012T	015240	T15	27.40
030440	C7792VXD12-A5.00Z11R	5.000	2.480	-	1.500	0.098	11	015263	D4012T	015240	T15	27.40
030441	C7792VXD12-6.00Z8R	6.000	2.480	-	1.500	0.098	8	015263	D4012T	015240	T15	27.40
030442	C7792VXD12-6.00Z12R	6.000	2.480	-	1.500	0.098	12	015263	D4012T	015240	T15	27.40
033071	C7792VXD12-6.30Z8R	6.300	2.480	-	1.500	0.098	8	015263	D4012T	015240	T15	27.40

Product		Dimensions (inch)						Spares				
EDP	Item Description	D	L/H	M	d ₁	ap max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.
7792VXD12 Modular Head												
031086	A7792VXD12SA1.25Z2R2	1.250	1.693	M16	0.669	0.098	2	015262	D4010T	015240	T15	27.40
030727	A7792VXD12SA1.5Z3R1.7	1.500	1.750	M16	0.669	0.098	3	015262	D4010T	015240	T15	27.40

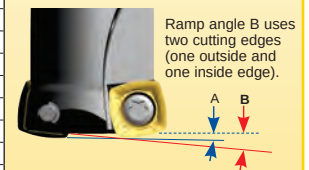
Note: For cylindrical shank extensions in high density alloy with through coolant refer to page 45.

7792VXD12 Technical Information (inch)

Product		Dimensions							Max RPM
EDP	Item Description	Facing Pitch	Ramping Angle A ° B °		Helical Hole min. - max.		ap max Helical / Linear	ae max Plunging	
031196	C7792VXD12CA1.25Z2R3	0.526	1.80	2.60	1.630	2.420	0.070	0.354	31,500
033070	C7792VXD12CA1.2/1.5Z3R3	0.770	0.95	1.60	2.130	2.920	0.070	0.354	27,500
029480	C7792VXD12-A2.00Z3R	1.276	0.90	1.40	3.130	3.920	0.070	0.354	22,500
029481	C7792VXD12-A2.00Z4R	1.276	0.90	1.40	3.130	3.920	0.070	0.354	22,500
030485	C7792VXD12-A2.00Z5R	1.276	0.90	1.40	3.370	3.920	0.070	0.354	22,500
029482	C7792VXD12-A2.50Z4R	1.776	0.60	0.90	4.130	4.920	0.070	0.354	22,500
029483	C7792VXD12-A2.50Z5R	1.776	0.60	0.90	4.130	4.920	0.070	0.354	22,500
029484	C7792VXD12-A3.00Z5R	2.276	0.45	0.90	5.130	5.920	0.070	0.354	17,500
030486	C7792VXD12-A3.00Z8R	2.276	0.45	0.90	5.130	5.920	0.070	0.354	17,500
030437	C7792VXD12-A4.00Z6R	3.270	0.31	1.42	7.130	7.920	0.070	0.354	14,500
030438	C7792VXD12-A4.00Z9R	3.270	0.31	1.42	7.130	7.920	0.070	0.354	14,500
030439	C7792VXD12-A5.00Z8R	4.270	0.24	1.04	9.130	9.920	0.070	0.354	13,000
030440	C7792VXD12-A5.00Z11R	4.270	0.24	1.04	9.130	9.920	0.070	0.354	13,000
030441	C7792VXD12-6.00Z8R	5.270	0.19	0.82	11.130	11.920	0.070	0.354	11,500
030442	C7792VXD12-6.00Z12R	5.270	0.19	0.82	11.130	11.920	0.070	0.354	11,500
033071	C7792VXD12-6.30Z8R	5.570	0.18	0.38	11.130	11.920	0.070	0.354	11,000
031086	A7792VXD12SA1.25Z2R2	0.520	2.60	2.60	1.630	2.420	0.070	0.354	31,500
030727	A7792VXD12SA1.5Z3R1.7	0.770	0.95	1.60	2.130	2.920	0.070	0.354	27,500

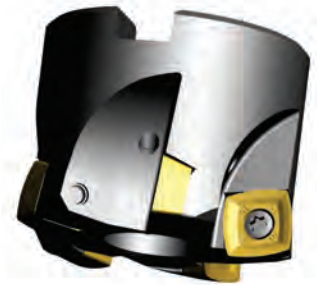
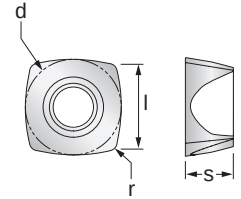


Ramp angle A uses one outside cutting edge only.



A = max ramp angle utilizing full face contact

B = max ramp angle utilizing full contact + internal corner radius



Product			Application & Material			Dimensions (inch)				
EDP	Item Description	Grade	Facing	Slotting	Plunging	d (IC)	l	s	r	h _m min
			Depth of Cut (inch)							
			a _p max. 0.098	a _p max. 0.079	a _e max. 0.354					
029490	XDLW120508SR-D	X400				0.472	0.472	0.219	0.031	0.004
029488	XDLW120508SR-D	X500				0.472	0.472	0.219	0.031	0.004
029489	XDLW120508SR-D	SC3025				0.472	0.472	0.219	0.031	0.004
029682	XDLT120508ER-D41	X500				0.472	0.472	0.219	0.031	0.002
031534	XDLT120508ER-D41	SP6519				0.472	0.472	0.219	0.031	0.002
033068	XDLT120508ER-D41	SC6525				0.472	0.472	0.219	0.031	0.002
029638	XDLT120508ER-D721	GH2				0.472	0.472	0.219	0.031	0.001
030783	XDLT120512ER-D411	X500				0.472	0.472	0.219	0.047	0.002
030792	XDLT120512ER-D411	SP6519				0.472	0.472	0.219	0.047	0.002

Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 19.

XDLW120508SR-D X500 should be used for Alloy Steel and Stainless Steel with heavy scale.

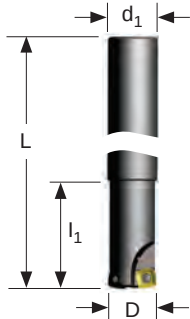
XDLT120512ER-D411 is a more positive geometry than the -D-41 with a larger radius which increases performance during smaller radial engagements or where chipping may occur when using the -D-41 geometry. XDLT120512ER-D411 uses less power than the -D-41 geometry.

7792VXD12 Feeds f_z (inch/tooth)

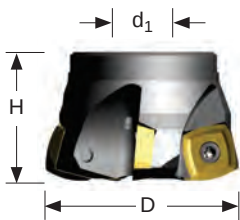
Geometry	Grade	Operation	Unalloyed Steel	Alloyed Steel	Stainless Steel	Stainless Steel Refractory PH	Gray Iron	Spheroidal-Ductile Iron	Malleable Iron	Aluminum & Alloys <16% Si 116 HBN	Aluminum & Silicon >16% Si 92 HBN	HTA Iron Based Alloys	HTA Cobalt Based Alloys	HTA Nickel Based Alloys	HTA Titanium Based Alloys	Hard Steel >1400 N/mm ² >415 HBN	Chilled Cast Iron >1400 N/mm ² >400 HBN
			Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.
SR-D	X400	Facing	0.012 - 0.106	0.012 - 0.098	-	-	-	-	-	-	-	-	-	-	-	0.012 - 0.047	0.012 - 0.059
SR-D	X400	Slotting	0.012 - 0.079	0.012 - 0.079	-	-	-	-	-	-	-	-	-	-	-	0.012 - 0.031	0.012 - 0.039
SR-D	X400	Plunging	0.004 - 0.012	0.004 - 0.010	-	-	-	-	-	-	-	-	-	-	-	0.004 - 0.005	0.004 - 0.006
SR-D	X500	Facing	-	0.012 - 0.098	0.012 - 0.067	0.012 - 0.047	-	-	-	-	-	-	-	-	-	-	-
SR-D	X500	Slotting	-	0.012 - 0.079	0.012 - 0.059	0.012 - 0.039	-	-	-	-	-	-	-	-	-	-	-
SR-D	X500	Plunging	-	0.004 - 0.010	0.004 - 0.010	0.004 - 0.007	-	-	-	-	-	-	-	-	-	-	-
SR-D	SC3025	Facing	-	-	-	-	0.012 - 0.118	0.012 - 0.110	0.012 - 0.098	-	-	-	-	-	-	-	-
SR-D	SC3025	Slotting	-	-	-	-	0.012 - 0.098	0.012 - 0.091	0.012 - 0.083	-	-	-	-	-	-	-	-
SR-D	SC3025	Plunging	-	-	-	-	0.004 - 0.012	0.004 - 0.011	0.004 - 0.010	-	-	-	-	-	-	-	-
ER-D41	X500	Facing	-	-	0.008 - 0.055	0.008 - 0.030	-	-	-	-	-	0.008 - 0.033	0.008 - 0.033	0.008 - 0.033	0.008 - 0.040	-	-
ER-D41	X500	Slotting	-	-	0.008 - 0.043	0.008 - 0.026	-	-	-	-	-	0.004 - 0.028	0.004 - 0.028	0.004 - 0.028	0.004 - 0.031	-	-
ER-D41	X500	Plunging	-	-	0.004 - 0.008	0.003 - 0.006	-	-	-	-	-	0.002 - 0.004	0.002 - 0.004	0.002 - 0.004	0.002 - 0.005	-	-
ER-D41	SP6519	Facing	0.012 - 0.098	0.012 - 0.091	0.008 - 0.047	0.008 - 0.030	0.012 - 0.098	0.012 - 0.091	-	-	-	0.008 - 0.033	0.008 - 0.033	0.008 - 0.033	0.008 - 0.040	-	-
ER-D41	SP6519	Slotting	0.012 - 0.079	0.012 - 0.071	0.008 - 0.039	0.006 - 0.024	0.012 - 0.079	0.012 - 0.071	-	-	-	0.004 - 0.028	0.004 - 0.028	0.004 - 0.028	0.004 - 0.031	-	-
ER-D41	SP6519	Plunging	0.004 - 0.009	0.004 - 0.007	0.004 - 0.007	0.002 - 0.004	0.004 - 0.009	0.004 - 0.007	-	-	-	0.002 - 0.004	0.002 - 0.004	0.002 - 0.004	0.002 - 0.005	-	-
ER-D41	SC6525	Facing	0.008 - 0.079	0.008 - 0.065	-	-	0.012 - 0.098	0.012 - 0.090	-	-	-	-	-	-	-	-	-
ER-D41	SC6525	Slotting	0.008 - 0.070	0.008 - 0.062	-	-	0.012 - 0.079	0.012 - 0.071	-	-	-	-	-	-	-	-	-
ER-D41	SC6525	Plunging	0.004 - 0.009	0.004 - 0.008	-	-	0.004 - 0.009	0.004 - 0.007	-	-	-	-	-	-	-	-	-
ER-D721	GH2	Facing	-	-	-	-	-	-	-	0.012 - 0.059	0.012 - 0.059	-	-	-	-	-	-
ER-D721	GH2	Slotting	-	-	-	-	-	-	-	0.012 - 0.059	0.012 - 0.059	-	-	-	-	-	-
ER-D721	GH2	Plunging	-	-	-	-	-	-	-	0.004 - 0.016	0.004 - 0.016	-	-	-	-	-	-
ER-D411	X500	Facing	-	-	0.008 - 0.055	0.008 - 0.035	-	-	-	-	-	0.008 - 0.033	0.008 - 0.033	0.008 - 0.033	0.008 - 0.039	-	-
ER-D411	X500	Slotting	-	-	0.008 - 0.043	0.008 - 0.031	-	-	-	-	-	0.004 - 0.028	0.004 - 0.028	0.004 - 0.028	0.004 - 0.031	-	-
ER-D411	X500	Plunging	-	-	0.004 - 0.008	0.003 - 0.006	-	-	-	-	-	0.002 - 0.004	0.002 - 0.004	0.002 - 0.004	0.002 - 0.005	-	-
ER-D411	SP6519	Facing	0.012 - 0.098	0.012 - 0.091	0.008 - 0.047	0.008 - 0.030	0.012 - 0.098	0.012 - 0.091	-	-	-	0.008 - 0.033	0.008 - 0.033	0.008 - 0.033	0.008 - 0.039	-	-
ER-D411	SP6519	Slotting	0.012 - 0.079	0.012 - 0.071	0.008 - 0.039	0.006 - 0.024	0.012 - 0.079	0.012 - 0.071	-	-	-	0.004 - 0.028	0.004 - 0.028	0.004 - 0.028	0.004 - 0.031	-	-
ER-D411	SP6519	Plunging	0.004 - 0.009	0.004 - 0.007	0.004 - 0.007	0.002 - 0.004	0.004 - 0.009	0.004 - 0.007	-	-	-	0.002 - 0.004	0.002 - 0.004	0.002 - 0.004	0.002 - 0.005	-	-

Note: HTA = High Temperature Alloys

Note: Speed recommendations can be found on page 14.



Cylindrical Shank

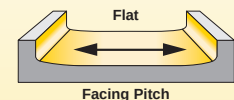
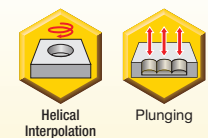


Shell Mill Fixation

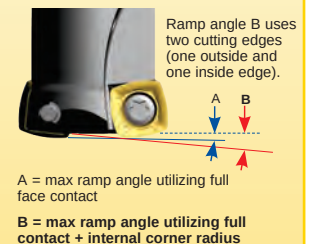
Product		Dimensions (inch)						Spares				
EDP	Item Description	D	L/H	l ₁	d ₁	ap max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.
7792VXE16 Cylindrical Shank												
034853	C7792VXE16CA1.5Z2R4	1.500	6.772	4.000	1.500	0.138	2	031225	DP5013T	030819	TP20	53,9
034854	C7792VXE16CA2.0Z3R4	2.000	6.772	4.000	1.500	0.138	3	031225	DP5013T	030819	TP20	53,9
7792VXE16 Shell Mill Fixation												
031282	C7792VXE16-A2.5Z05R	2.500	1.574	-	1.000	0.138	5	031225	DP5013T	030819	TP20	53,9
031283	C7792VXE16-A3.0Z6R	3.000	1.970	-	1.000	0.138	6	031225	DP5013T	030819	TP20	53,9
031284	C7792VXE16-A4.0Z8R	4.000	1.970	-	1.250	0.138	8	031225	DP5013T	030819	TP20	53,9
031285	C7792VXE16-A5.0Z10R	5.000	2.480	-	1.500	0.138	10	031225	DP5013T	030819	TP20	53,9
031286	C7792VXE16-6.0Z12	6.000	2.480	-	1.500	0.138	12	031225	DP5013T	030819	TP20	53,9

7792VXE16 Technical Information (inch)

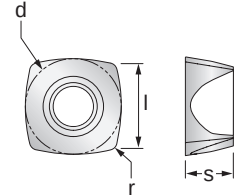
Product		Dimensions							Max RPM
EDP	Item Description	Facing Pitch	Ramping Angle		Helical Hole min. - max.		ap max Helical / Linear	ae max Plunging	
			A °	B °					
034853	C7792VXE16CA1.5Z2R4	0.556	2.55	3.35	1.820	2.920	0.098	0.512	34500
034854	C7792VXE16CA2.0Z3R4	1.050	1.36	2.85	2.820	3.920	0.098	0.512	27000
031282	C7792VXE16-A2.5Z05R	1.460	0.86	1.00	3.820	4.920	0.098	0.512	22,000
031283	C7792VXE16-A3.0Z6R	1.960	0.58	0.65	4.820	5.920	0.098	0.512	19,500
031284	C7792VXE16-A4.0Z8R	2.960	0.42	0.51	6.820	7.920	0.098	0.512	16,500
031285	C7792VXE16-A5.0Z10R	3.960	0.32	0.37	8.820	9.920	0.098	0.512	14,500
031286	C7792VXE16-6.0Z12	4.960	0.23	0.27	10.820	11.920	0.098	0.512	13,000



Ramp angle A uses one outside cutting edge only.



Depth of Cut (ap)



Product			Application & Material			Dimensions (inch)				
EDP	Item Description	Grade	Facing	Slotting	Plunging	d (IC)	l	s	r	h _m min
			Depth of Cut (inch)							
			a _p max. 0.138	a _p max. 0.118	a _e max. 0.512					
031291	XELW160512SR-D	X400				0.661	0.661	0.219	0.047	0.005
031292	XELW160512SR-D	SC3025				0.661	0.661	0.219	0.047	0.005
031293	XELT160512ER-D41	X500				0.661	0.661	0.219	0.047	0.005
031294	XELT160512ER-D41	SP6519				0.661	0.661	0.219	0.047	0.005
033069	XELT160512ER-D41	SC6525				0.661	0.661	0.219	0.047	0.005

Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 19.

7792VXE16 Feeds f_z (inch/tooth)

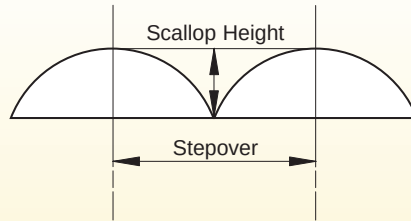
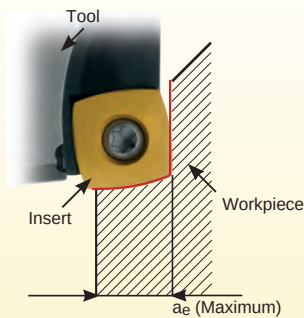
Geometry	Grade	Operation	Unalloyed Steel	Alloyed Steel	Stainless Steel	Stainless Steel Refractory PH	Gray Iron	Spheroidal-Ductile Iron	Malleable Iron	Aluminum & Alloys <16% Si 116 HBN	Aluminum & Silicon >16% Si 92 HBN	HTA Iron Based Alloys	HTA Cobalt Based Alloys	HTA Nickel Based Alloys	HTA Titanium Based Alloys	Hard Steel >1400 N/mm ² >415 HBN	Chilled Cast Iron >1400 N/mm ² >400 HBN
			Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.
SR-D	X400	Facing	0.012 - 0.079	0.012 - 0.071	-	-	-	-	-	-	-	-	-	-	-	0.012 - 0.031	0.012 - 0.039
SR-D	X400	Slotting	0.012 - 0.067	0.012 - 0.059	-	-	-	-	-	-	-	-	-	-	-	0.012 - 0.020	0.012 - 0.024
SR-D	X400	Plunging	0.004 - 0.010	0.004 - 0.008	-	-	-	-	-	-	-	-	-	-	-	0.004 - 0.004	0.004 - 0.005
SR-D	SC3025	Facing	-	-	-	-	0.012 - 0.080	0.012 - 0.071	0.012 - 0.059	-	-	-	-	-	-	-	-
SR-D	SC3025	Slotting	-	-	-	-	0.012 - 0.060	0.012 - 0.051	0.012 - 0.047	-	-	-	-	-	-	-	-
SR-D	SC3025	Plunging	-	-	-	-	0.004 - 0.008	0.004 - 0.007	0.004 - 0.006	-	-	-	-	-	-	-	-
ER-D41	X500	Facing	-	-	0.008 - 0.040	0.008 - 0.025	-	-	-	-	-	0.008 - 0.024	0.008 - 0.024	0.008 - 0.024	0.008 - 0.032	-	-
ER-D41	X500	Slotting	-	-	0.008 - 0.032	0.008 - 0.020	-	-	-	-	-	0.004 - 0.016	0.004 - 0.016	0.004 - 0.016	0.004 - 0.020	-	-
ER-D41	X500	Plunging	-	-	0.005 - 0.006	0.003 - 0.005	-	-	-	-	-	0.002 - 0.004	0.002 - 0.004	0.002 - 0.004	0.002 - 0.005	-	-
ER-D41	SP6519	Facing	0.012 - 0.059	0.012 - 0.047	0.008 - 0.040	0.008 - 0.020	0.012 - 0.070	0.012 - 0.055	-	-	-	0.008 - 0.024	0.008 - 0.024	0.008 - 0.024	0.008 - 0.032	-	-
ER-D41	SP6519	Slotting	0.012 - 0.047	0.012 - 0.043	0.008 - 0.032	0.008 - 0.018	0.012 - 0.050	0.012 - 0.045	-	-	-	0.004 - 0.016	0.004 - 0.016	0.004 - 0.016	0.004 - 0.020	-	-
ER-D41	SP6519	Plunging	0.004 - 0.009	0.004 - 0.008	0.005 - 0.006	0.003 - 0.005	0.004 - 0.008	0.004 - 0.006	-	-	-	0.002 - 0.004	0.002 - 0.004	0.002 - 0.004	0.002 - 0.005	-	-
ER-D41	SC6525	Facing	0.012 - 0.047	0.012 - 0.038	-	-	0.012 - 0.070	0.012 - 0.055	-	-	-	-	-	-	-	-	-
ER-D41	SC6525	Slotting	0.012 - 0.045	0.012 - 0.035	-	-	0.012 - 0.050	0.012 - 0.045	-	-	-	-	-	-	-	-	-
ER-D41	SC6525	Plunging	0.004 - 0.009	0.004 - 0.008	-	-	0.004 - 0.008	0.004 - 0.006	-	-	-	-	-	-	-	-	-

Note: HTA = High Temperature Alloys

Note: Speed recommendations can be found on page 14.



Speed v_c (SFM)														
7792VX Series			Wear Resistance											
			- ← → +											
			Speed min. - max.											
Coolant Recommendation														
Recommended ● Possible ◎														
ISO	Materials	Rm and Hardness	PVD X Grade		CVD X Grade		PVD Standard		Uncoated Micrograin		CVD Standard		CVD Standard	
			ⓘ ⓘ	ⓘ ⓘ	ⓘ ⓘ	ⓘ ⓘ	ⓘ ⓘ	ⓘ ⓘ	ⓘ ⓘ	ⓘ ⓘ	ⓘ ⓘ	ⓘ ⓘ	ⓘ ⓘ	ⓘ ⓘ
P	Unalloyed Steel	<600 N/mm ² <180 HBN	●	●			●	●			●	●		
		<950 N/mm ² <280 HBN												
	Alloyed Steel	700-950 N/mm ² 200-280 HBN	●	●	●	●	●	●			●	●		
		950-1200 N/mm ² 280-355 HBN												
M	Stainless Steel	Austenitic + Ferritic 300 series			●	●	●	●						
		Martensitic 400 series												
	PH Stainless	Refractory P.H.			●	●	●	●						
K	Cast Iron	Grey GG-Ft												
		Spheroidal-Ductile GGG-FGS			●	●	●	●			●	●		
		Malleable GTS - MN/MP												
N	Aluminum & Alloys	Aluminum & Alloys < 16% Si 116 HBN					●	●						
		Aluminum & Silicon > 16% Si 92 HBN												
S	High Temperature Alloys	Iron Based												
		Cobalt Based												
		Nickel Based												
		Titanium Based												
H	Hard Materials	Hard Steel >1400 N/mm ² >415 HBN	●											
		Chilled Cast Iron >1400 N/mm ² > 400 HBN												

Plunging


The cutting edge should not be in contact with the material face after machining to maintain the cutting edge quality.

The scallop height is calculated in relation to the step over.



The maximum radial engagement is directly in relation to insert cutting edge length.

For insert type: **XP...06** the a_e , max is **0.118 in.**

For insert type: **XD...09** the a_e , max is **0.236 in.**

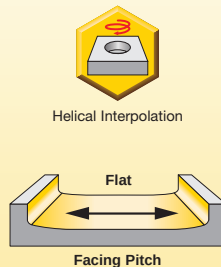
For insert type: **XD...12** the a_e , max is **0.354 in.**

For insert type: **XE...16** the a_e , max is **0.512 in.**

Plunging Information (inch) - tool definition-scallop height and step over

	Tool definition (inch)																					
	7792VXP06				7792VXD09				7792VXD12								7792VXE16					
Diameter	0.625	0.750	1.000	1.250	1.000	1.250	1.500	2.000	1.250	1.500	2.000	2.500	3.000	4.000	5.000	6.000	6.300	2.500	3.000	4.000	5.000	6.000
Insert size	0.236	0.236	0.236	0.236	0.354	0.354	0.354	0.354	0.472	0.472	0.472	0.472	0.472	0.472	0.472	0.472	0.472	0.630	0.630	0.630	0.630	0.630
a _e max	0.118	0.118	0.118	0.118	0.236	0.236	0.236	0.236	0.354	0.354	0.354	0.354	0.354	0.354	0.354	0.354	0.354	0.512	0.512	0.512	0.512	0.512
Scallop height	Step over (inch)																					
0.010	0.156	0.175	0.196	0.222	0.196	0.222	0.248	0.278	0.222	0.242	0.283	0.312	0.352	0.393	0.440	0.486	0.498	0.312	0.352	0.393	0.440	0.498
0.020	0.219	0.246	0.276	0.313	0.276	0.313	0.350	0.392	0.313	0.341	0.400	0.440	0.496	0.556	0.621	0.686	0.703	0.440	0.496	0.556	0.621	0.703
0.030	0.266	0.299	0.336	0.381	0.336	0.381	0.427	0.479	0.381	0.417	0.488	0.538	0.607	0.680	0.760	0.840	0.861	0.538	0.607	0.680	0.760	0.861
0.039	0.305	0.343	0.386	0.439	0.386	0.439	0.492	0.551	0.439	0.480	0.562	0.620	0.700	0.783	0.877	0.969	0.993	0.620	0.700	0.783	0.877	0.993
0.079	0.417	0.472	0.534	0.610	0.534	0.610	0.687	0.772	0.610	0.669	0.787	0.870	0.983	1.102	1.235	1.366	1.400	0.870	0.983	1.102	1.235	1.400
0.118	0.492	0.562	0.640	0.734	0.640	0.734	0.830	0.935	0.734	0.808	0.955	1.056	1.197	1.343	1.506	1.667	1.709	1.056	1.197	1.343	1.506	1.709
0.157					0.722	0.833	0.945	1.068	0.833	0.920	1.091	1.209	1.373	1.543	1.732	1.918	1.967	1.209	1.373	1.543	1.732	1.967
0.197					0.787	0.915	1.042	1.181	0.915	1.012	1.207	1.341	1.525	1.716	1.929	2.138	2.192	1.341	1.525	1.716	1.929	2.192
0.236					0.841	0.983	1.125	1.279	0.983	1.093	1.308	1.456	1.659	1.870	2.104	2.334	2.394	1.456	1.659	1.870	2.104	2.393
0.276									1.042	1.162	1.398	1.559	1.780	2.009	2.263	2.512	2.577	1.559	1.780	2.009	2.263	2.577
0.315									1.091	1.222	1.477	1.652	1.890	2.136	2.409	2.676	2.746	1.652	1.890	2.136	2.409	2.746
0.354									1.133	1.274	1.549	1.736	1.991	2.254	2.544	2.889	2.903	1.736	1.991	2.254	2.544	2.903
0.394																		1.813	2.083	2.362	2.670	3.050
0.433																		1.883	2.169	2.464	2.788	3.188
0.472																		1.948	2.249	2.559	2.900	3.319
0.512																		2.007	2.324	2.648	2.998	3.405

Max. flat surface (inch)		
Insert size	Cutter dia.	Pitch
06	0.625	0.255
	0.750	0.380
	1.000	0.630
	1.250	0.880
09	1.000	0.480
	1.250	0.730
	1.500	0.980
	2.000	1.480
12	1.250	0.526
	1.500	0.770
	2.000	1.270
	2.500	1.770
	3.000	2.270
	4.000	3.270
	5.000	4.270
16	6.000	5.270
	6.300	5.570
	2.500	1.460
	3.000	1.960
	4.000	2.960
	5.000	3.960
	6.000	4.960



Helical interpolation capacity for 7792VX (inch)			
Insert Size	Cutter dia.	Hole min.	Hole max.
06	0.625	0.850	1.170
	0.750	1.100	1.420
	1.000	1.600	1.920
	1.250	2.100	2.420
09	1.000	1.370	1.920
	1.250	1.870	2.420
	1.500	2.370	2.920
	2.000	3.370	3.920
12	1.250	1.630	2.420
	1.500	2.130	2.920
	2.000	3.130	3.920
	2.500	4.130	4.920
	3.000	5.130	5.920
	4.000	7.130	7.920
	5.000	9.130	9.920
16	6.000	11.130	11.920
	6.300	11.730	12.520
	2.500	3.820	4.920
	3.000	4.820	5.920
	4.000	6.820	7.920
	5.000	8.820	9.920
	6.000	10.820	11.920

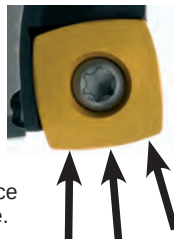


The advantages of facemilling and producing cavities with Stellram's high feed face mill are numerous.

The unique design of the insert, approach angle and the cutter body ensure the cutting forces are predominantly directed in the axial direction. The example shown with a round insert tool shows complex forces which result in high levels of vibration and damage to the cutting edge.

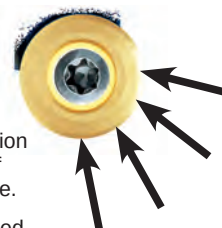
7792VX

- Cutting forces predominantly axial.
- Relationship between cutting edge and work piece is at its most stable.
- Results in high feed rates and consistent tool life.



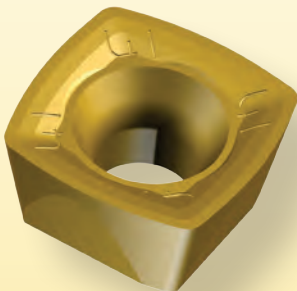
Round Insert Tools

- Tangential forces act around the radius.
- Leads to vibration and damage of the cutting edge.
- Leads to reduced feed and lower productivity.



The 7792VX machines with a constant volume of chip throughout all aspects of producing cavities and produces a side wall that is close to profile.

Round insert tools have increasing chip volume through the process.



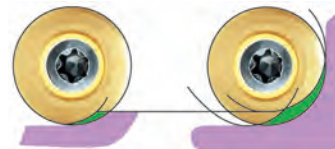
7792VX

- Constant cutting section (chip volume) irrespective of position in cavity.
- Producing a close to profile side wall.
- Near-square side walls possible.



Center clearance

Side wall



Round insert

- Greater surface contact.
- Increased chip section for side wall machining.
- Vibration in corners.
- Undulating side wall cusps.

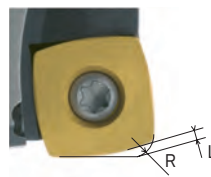


CNC Program - Corner Radius Definition

The use of common CAD / CAM systems requires a round insert dimension to be known for cavity machining. This is available with 7792VX cutters as shown to the right and in the reference table.

For finish pass applications:

Wiper Facet for finishing use max. feed 0.031 inch/ Revolution (IPR)



Programming Data (inch)			
Insert size (mm)	Radius	R	L
06	0.031	0.054	0.016
09	0.031	0.079	0.028
	0.047	0.089	0.026
12	0.031	0.098	0.040
	0.047	0.107	0.038
16	0.047	0.164	0.057

Calculation of the average chip thickness in relation with the D.O.C. (Axial)

Formula: Program Feed Rate (f_z)

$$f_z = h_m \times \sqrt{\frac{d}{a_p}}$$

h_m = Average chip thickness

a_p = Depth of cut

f_z = Feed per tooth

d = Insert diameter (1.772")

Theoretical Diameter for all high feed insert sizes = 1.772"

Formula: Average Chip Thickness (h_m)

$$h_m = f_z \times \sqrt{\frac{a_p}{d}}$$

Calculation of the average chip thickness in relation with the a_e (Radial Engagement) if a_e is less than 50% of Dia.

Formula: Program Feed Rate (f_z)

$$f_z = h_m \times \sqrt{\frac{d}{a_e}}$$

h_m = Average chip thickness

a_e = Radial engagement

f_z = Feed per tooth

d = Cutter diameter

Formula: Average Chip Thickness (h_m)

$$h_m = f_z \times \sqrt{\frac{a_e}{d}}$$



7792 Case Histories



Material: 4140 steel – 28-to 32-HRC
 Industry: Die/Mold
 Job: 17 holes – 2.031" diameter, 2.667" deep
 Cycle time: 4.5 hours

7792 Solution:

Cutter: Modular 7792VXD09 (1.0" Cutter)
 Extension: Anti-vibration, heavy-alloy Modular Shank
 Insert Grade: X400
 Process: High Feed Helical Interpolation
 Cycle time: 1 minute 45 seconds per hole
 Total Cycle time: 30 minutes

90% Reduction in Cycle Time



Material: 6-4 Titanium
 Job: Machine pockets in aerospace component
 Cycle time: 5.5 hours

7792 Solution:

Cutter: 7792VXD12 (6.0" Cutter)
 Insert Grade: X500
 Cycle time: 1 hour 20 minutes

75% Reduction in Cycle Time



Material: 6-4 Titanium
 Job: Turn a 57.6" diameter by 13.4" deep ring
 Industry: Aerospace
 Turning Cycle time: 4 hours 35 minutes

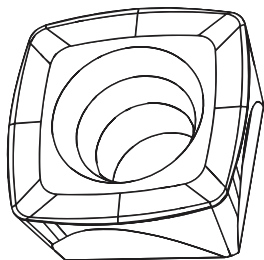
7792 Solution:

Cutter: 7792VXE16 (5.0" Cutter – 125mm)
 Insert Grade: X500
 Process: Mill turning
 Workpiece rotates on B axis at 0.26 RPM
 Spiral milling feed rate of 60mm per revolution
 Cycle time: 2 hours 24 minutes

Spiral Milling Cuts Cycle Time 48%

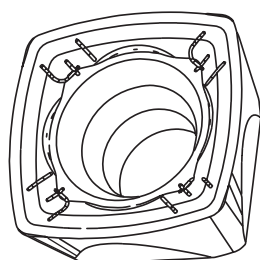


High Feed Geometries



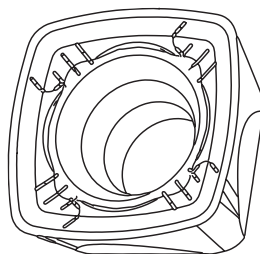
-D 

Fully ground with flat top and variable hone.
Hardened Materials up to 58HRC.



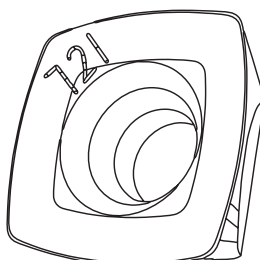
-D41 

Positive geometry that reduces power consumption.



-D411 

Positive geometry with larger corner radius (0.047" | 1.2mm) reduces cutting energy and provides better edge protection during lower radial engagement applications.



-D721 

Positive, periphery ground, polished top rake face and sharp edge allows a freer cutting action and reduces built-up edge.

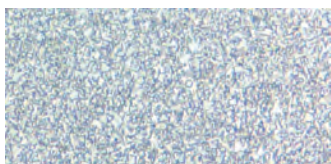
Material Guide – Key to Recommended Inserts

Material Designation

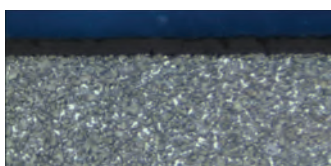
 Unalloyed Steels
  Alloyed Steels
  Stainless Steels
  PH Stainless
  Cast Irons
  Aluminum & Alloys
  High Temp. Alloys
  Hard Materials



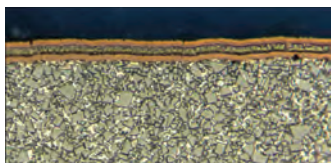
High Feed Grades


GH2 

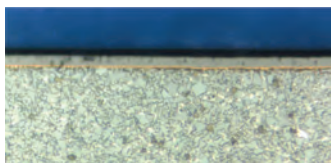
Uncoated Micrograin – Tough and able to handle high pressure, vibration and shock.


X400   

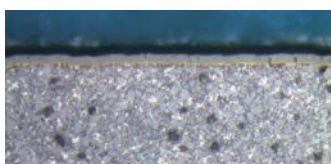
Coating Type: PVD, TiAlN – Designed for high metal removal rates and interrupted cuts.


X500  

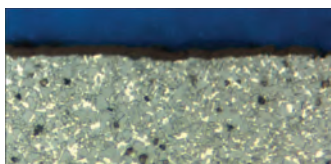
Coating Type: CVD, TiN-TiC-TiN – High level of shock resistance; operates at low to medium cutting speeds; high metal removal rates.


SC3025 

Coating Type: CVD, TiN - TiCN - Al_2O_3 – Multi-layer CVD coating offers wear and abrasion resistance.


SC6525   

Coating Type: CVD, TiN-TiCN- Al_2O_3 – High Performance Machining at elevated surface speeds.


SP6519 

Coating Type: PVD, TiAlN – Super nano coating is extremely hard for unmatched performance and virtually eliminates residual stress.

Material Guide – Key to Recommended Inserts

Material Designation

 Unalloyed Steels
  Alloyed Steels
  Stainless Steels
  PH Stainless
  Cast Irons
  Aluminum & Alloys
  High Temp. Alloys
  Hard Materials



The **77** Family

- Patented Cutter Designs
- Patented Insert Designs
- Patented Grades

**Excellent for roughing, semi-finishing
and finishing of high-performance materials**



The 77 Family

Modular

0.625" – 1.50"



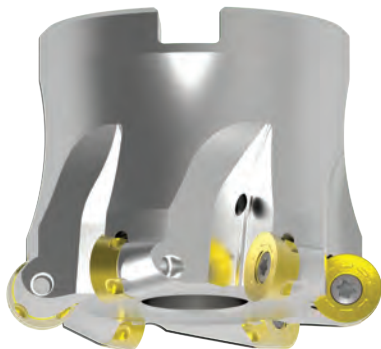
Cylindrical

0.750" – 1.250"



Shell

1.50" – 8.50"



Three Families of Cutters are Featured:

- **7700VR08** small diameter standard button cutters (Cylindrical and Modular: 0.625" to 1.250")
- **7710VRD20** Anti-Rotation Shell Mill cutters (2.50" to 8.50")
- **7713VR10 and 12** Patented Anti-Rotation Cutters (Cylindrical, Modular and Shell: 1.00" to 3.00")

This collection of cutters shows the dynamics of Kennametal technology—taking the conventional to the highest level to machine the toughest high performance alloys.

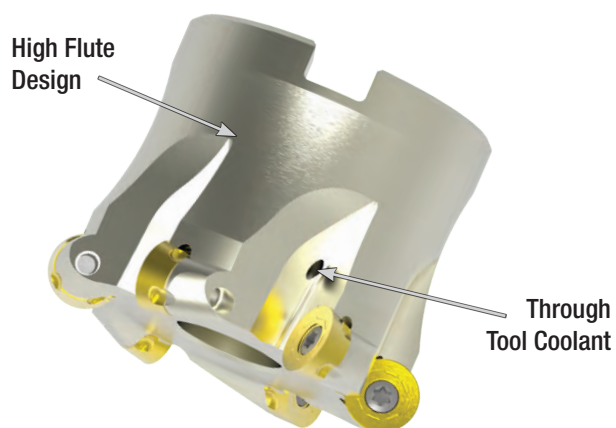
Continuous Cutting Under the Toughest Conditions

- Cutter diameters from 0.625" to 8.50"
- Maximum number of teeth for heavy feed operations
- Medium and close pitch cutters available
- Round button insert for maximum strength
- 0.315" to 0.787" insert diameters
- Low cutting forces
- Flute design maximizes chip evacuation
- Satin Silver coating extends cutter body life (only 7713VR series)
- Modular tools feature an Anti-Vibration Tungsten Extension with Through Coolant

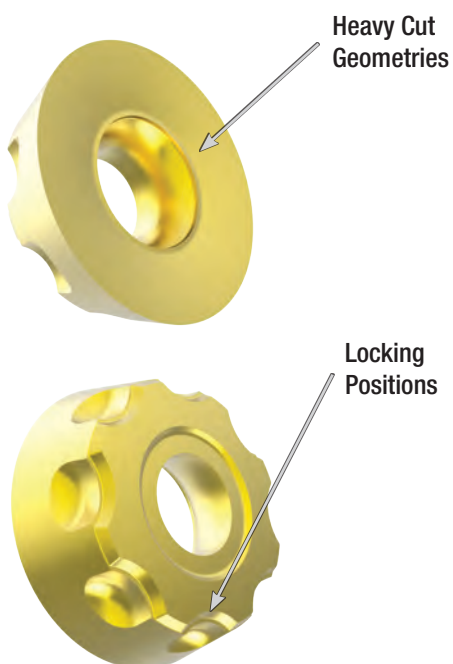


VRD / VR Anti-Rotation Technology

Maximum Chip Evacuation



Maximum Tool Life



The High Flute Indexing Cutter

The 7710 and 7713 series cutters feature a unique patented pocket system that locks the inserts into position to prevent inserts from moving during heavy machining.

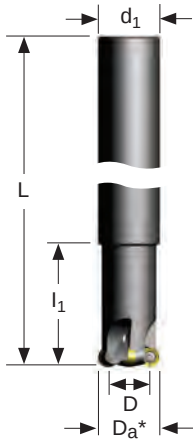
- Through Coolant and unique flow through pocket design maximize chip evacuation and increase tool life

7713 Patented series cutter bodies are armored with Satin Silver plating to protect body integrity in milling high performance materials.

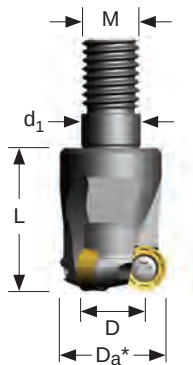
The Positive Indexing Round Insert

The Anti-Rotation insert features four, five or eight locking positions which mate with the pocket of the cutter body.

- Positive positioning of the insert throughout the heaviest cuts
- Maximum indexes to optimize tool life and reduce tooling costs



Cylindrical Shank



Modular Head

Product		Dimensions (inch)							Spares				
EDP	Item Description	Da*	D	L	l ₁	d ₁	a _p max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.
7700VR08 Cylindrical Shank - Medium and Fine Pitch													
031138	C7700VR08CA0.75Z3R1.5	0.750	0.435	7.000	1.575	0.750	0.157	3	015062	F3006T	013214	T9	12.40
031139	C7700VR08CA1.00Z3R1.9	1.000	0.685	8.000	1.969	1.000	0.157	3	015062	F3006T	013214	T9	12.40
031140	C7700VR08CA1.00Z4R1.9	1.000	0.685	8.000	1.969	1.000	0.157	4	015062	F3006T	013214	T9	12.40
031141	C7700VR08CA1.25Z4R2.7	1.250	0.935	10.000	2.756	1.250	0.157	4	015062	F3006T	013214	T9	12.40
031142	C7700VR08CA1.25Z5R2.7	1.250	0.935	10.000	2.756	1.250	0.157	5	015062	F3006T	013214	T9	12.40

D = Effective Diameter (Axis) from insert centerline to centerline.

Da* = Outside Diameter

Product		Dimensions (inch)							Spares				
EDP	Item Description	Da*	D	L	M	d ₁	a _p max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.
7700VR08 Modular Head - Medium and Fine Pitch													
031128	A7700VR08SA.625Z2R1.0	0.625	0.310	1.000	M8	0.335	0.157	2	015062	F3006T	013214	T9	12.40
031129	A7700VR08SA.750Z3R1.0	0.750	0.435	1.000	M10	0.413	0.157	3	015062	F3006T	013214	T9	12.40
031130	A7700VR08SA1.00Z3R1.4	1.000	0.685	1.400	M12	0.492	0.157	3	015062	F3006T	013214	T9	12.40
031131	A7700VR08SA1.00Z4R1.4	1.000	0.685	1.400	M12	0.492	0.157	4	015062	F3006T	013214	T9	12.40
031132	A7700VR08SA1.25Z5R1.4	1.250	0.935	1.400	M16	0.669	0.157	5	015062	F3006T	013214	T9	12.40

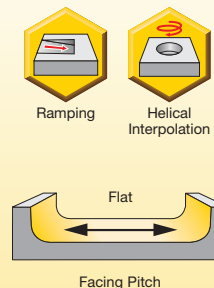
D = Effective Diameter (Axis) from insert centerline to centerline.

Da* = Outside Diameter

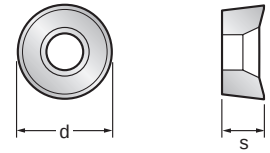
Note: For Cylindrical Shank extensions in high density alloy with through coolant refer to page 45.

7700VR08 Technical Information (inch)

Product		Dimensions					
EDP	Item Description	Facing Pitch	Ramping Angle °	Helical Hole min. - max.		a _p max Helical / Linear	Max RPM
031138	C7700VR08CA0.75Z3R1.5	0.435	7.20	0.949	1.421	0.100	84,000
031139	C7700VR08CA1.00Z3R1.9	0.685	7.85	1.449	1.921	0.100	67,000
031140	C7700VR08CA1.00Z4R1.9	0.685	7.85	1.449	1.921	0.100	67,000
031141	C7700VR08CA1.25Z4R2.7	0.935	7.40	1.949	2.421	0.100	57,000
031142	C7700VR08CA1.25Z5R2.7	0.935	7.40	1.949	2.421	0.100	57,000
031128	A7700VR08SA.625Z2R1.0	0.310	9.00	0.699	1.171	0.100	99,000
031129	A7700VR08SA.750Z3R1.0	0.435	13.00	0.949	1.421	0.100	84,000
031130	A7700VR08SA1.00Z3R1.4	0.685	7.85	1.449	1.921	0.100	67,000
031131	A7700VR08SA1.00Z4R1.4	0.685	7.85	1.449	1.921	0.100	67,000
031132	A7700VR08SA1.25Z5R1.4	0.935	7.20	1.949	2.421	0.100	57,000



Depth of Cut (a_p)



Product			Application & Material			Dimensions (inch)				
EDP	Item Description	Grade	Roughing ▼	Semi-Finishing ▼▼	Finishing ▼▼▼	d (IC)	l	s	r	h _m min
			Depth of Cut (inch)							
			a _p max -	a _p min - max 0.030 - 0.060	a _p min - max 0.004 - 0.030					
034544	RPEX0803M3F-701	SP4019	-	■	■ ■	0.315	-	0.125	0.157	0.001
023315	RPEX0803M3F-701	GH1	-	◆	◆	0.315	-	0.125	0.157	0.001
031312	RPEX0803M3E-701	X500	-	●	-	0.315	-	0.125	0.157	0.001
034543	RPEX0803M3E-701	SP6519	-	-	◆◆◆	0.315	-	0.125	0.157	0.001
015220	RPMT0803M3E-41	X500	-	●●	-	0.315	-	0.125	0.157	0.002
031473	RPMT0803M3E-41	SP6519	-	■ ■ ●	■ ■ ● ● ■	0.315	-	0.125	0.157	0.002
017308	RPMT0803M3E-41	MP91M	-	● ◆	● ◆	0.315	-	0.125	0.157	0.002
031186	RPHT0803M3E-422	X500	-	● ■ ◆◆	●	0.315	-	0.125	0.157	0.002
031187	RPHT0803M3E-422	SP6519	-	◆◆◆ ■ ■	◆◆ ■ ■ ●	0.315	-	0.125	0.157	0.002

Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 46.

7700VR08 Feeds f_z (inch/tooth)

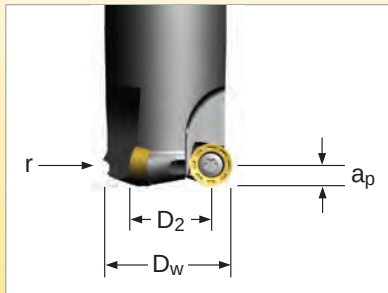
Geometry	Grade	Operation	Unalloyed Steel	Alloyed Steel	Stainless Steel	Stainless Steel Refractory PH	Gray Iron	Spheroidal-Ductile Iron	Malleable Iron	Aluminum & Alloys <16% Si 116 HBN	Aluminum & Silicon >16% Si 92 HBN	HTA Iron Based Alloys	HTA Cobalt Based Alloys	HTA Nickel Based Alloys	HTA Titanium Based Alloys	Hard Steel >1400 N/mm ² >415 HBN	Chilled Cast Iron >1400 N/mm ² >400 HBN
			Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.
F-701	SP4019	Contouring	-	-	-	-	-	-	-	0.001 - 0.003	0.001 - 0.002	0.001 - 0.002	0.001 - 0.002	0.001 - 0.003	0.001 - 0.004	-	-
F-701	GH1	Contouring	-	-	-	-	-	-	-	0.001 - 0.003	0.001 - 0.002	-	-	-	-	-	-
E-701	X500	Contouring	-	-	-	-	-	-	-	-	-	0.001 - 0.002	0.001 - 0.002	0.001 - 0.003	0.001 - 0.004	-	-
E-701	SP6519	Contouring	-	-	0.001 - 0.004	0.001 - 0.004	-	-	-	-	-	0.001 - 0.002	0.001 - 0.002	0.001 - 0.003	0.001 - 0.004	-	-
E-41	X500	Contouring	-	-	0.002 - 0.005	0.002 - 0.004	-	-	-	-	-	-	-	-	-	-	-
E-41	SP6519	Contouring	0.002 - 0.006	0.002 - 0.005	0.002 - 0.005	0.002 - 0.004	0.002 - 0.006	0.002 - 0.006	0.002 - 0.005	-	-	-	-	-	-	-	-
E-41	MP91M	Contouring	0.002 - 0.005	-	-	-	0.002 - 0.005	0.002 - 0.005	0.002 - 0.004	-	-	-	-	-	-	-	-
E-422	X500	Contouring	-	0.002 - 0.005	0.002 - 0.006	0.002 - 0.004	-	-	-	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.004	0.002 - 0.004	-	-
E-422	SP6519	Contouring	0.002 - 0.006	0.002 - 0.005	0.002 - 0.006	0.002 - 0.004	0.002 - 0.006	0.002 - 0.006	0.002 - 0.005	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.004	0.002 - 0.004	-	-

Note: HTA = High Temperature Alloys

Note: Speed recommendations can be found on page 26.



Speed v_c (SFM)													
7700VR Series			Wear Resistance										
			- ← → +										
			Speed min. - max.										
Coolant Recommendation													
Recommended ● Possible ◎													
ISO	Materials	Rm and Hardness	CVD X Grade		PVD X Grade		PVD Standard		PVD Standard		CVD Standard		Uncoated Micrograin
			● ◎	● ◎	● ◎	● ◎	● ◎	● ◎	● ◎	● ◎	● ◎	● ◎	
P	Unalloyed Steel	<600 N/mm ² <180 HBN	●	◎	425 - 885	●	◎	425 - 970	●	◎	460 - 1130	●	
		<950 N/mm ² <280 HBN	●	◎	375 - 785	●	◎	375 - 855	●	◎	395 - 1000	●	
	Alloyed Steel	700-950 N/mm ² 200-280 HBN	●	◎	330 - 690	●	◎	330 - 755	●	◎	345 - 885	●	
		950-1200 N/mm ² 280-355 HBN	●	◎	245 - 525	●	◎	245 - 575	●	◎	260 - 675	●	
		1200-1400 N/mm ² 355-415 HBN	●	◎	165 - 330	●	◎	165 - 360	●	◎	165 - 425	●	
			●	◎		●	◎		●	◎		●	
M	Stainless Steel	Austenitic + Ferritic 300 series	●	◎	375 - 820	●	◎	375 - 855	●	◎			
		Martensitic 400 series	●	◎	330 - 720	●	◎	345 - 755	●	◎			
	PH Stainless	Refractory P.H.	●	◎	165 - 360	●	◎	165 - 375	●	◎			
K	Cast Iron	Grey GG-Ft	●	◎		●	◎	460 - 970	●	◎	475 - 1200	●	
		Spheroidal-Ductile GGG-FGS	●	◎		●	◎	360 - 785	●	◎	375 - 935	●	
		Malleable GTS - MN/MP	●	◎		●	◎	330 - 720	●	◎	345 - 855	●	
			●	◎		●	◎		●	◎		●	
N	Aluminum & Alloys	Aluminum & Alloys < 16% Si 116 HBN	●	◎		●	◎		●	◎	1310 - 9500	●	1310 - 10005
		Aluminum + Silicon > 16% Si 92 HBN	●	◎		●	◎		●	◎	970 - 7615	●	970 - 8005
S	High Temperature Alloys	Iron Based	●	◎	75 - 160	●	◎	75 - 180	●	◎	80 - 210	●	
		Cobalt Based	●	◎	70 - 145	●	◎	70 - 160	●	◎	75 - 170	●	
		Nickel Based	●	◎	80 - 170	●	◎	80 - 180	●	◎	85 - 190	●	
		Titanium Based	●	◎	115 - 240	●	◎	120 - 260	●	◎	120 - 275	●	
H	Hard Materials	Hard Steel >1400 N/mm ² >415 HBN	●	◎		●	◎		●	◎		●	
		Chilled Cast Iron >1400 N/mm ² > 400 HBN	●	◎		●	◎		●	◎		●	


7700VR Technical Information

Working Diameter:

$$D_w = D_2 + 2 \times \sqrt{r^2 - (r - a_p)^2}$$

where:

- D_w = Working Diameter
- D_2 = Diameter of cutter insert center to center
- r = Insert radius
- a_p = Axial Depth of Cut

7700VR Technical Information

Formula to find programmed feed rate based on radial engagement and axial depth of cut.

$$f_z = \frac{h_m}{\frac{\sqrt{r^2 - (r - a_e)^2}}{r} \times \frac{\sqrt{r^2 - (r - a_p)^2}}{r}}$$

where:

f_z = Feed per tooth
 h_m = Average chip thickness
 r = Insert radius
 a_e = Radial Depth of Cut
 a_p = Axial Depth of Cut

Formula to calculate the average chip thickness h_m in relation with radial engagement and depth of cut.

$$h_m = f_z \times \frac{\sqrt{r^2 - (r - a_e)^2}}{r} \times \frac{\sqrt{r^2 - (r - a_p)^2}}{r}$$

Simplified formulas to evaluate h_m and f_z based on radial engagement or depth of cut.

Calculation of the average chip thickness in relation with the D.O.C. (Axial)
Formula: Program Feed Rate (f_z)

$$f_z = h_m \times \sqrt{\frac{d}{a_p}}$$

h_m = Average chip thickness
 a_p = Depth of cut
 f_z = Feed per tooth
 d = Insert diameter

Formula: Average Chip Thickness (h_m)

$$h_m = f_z \times \sqrt{\frac{a_p}{d}}$$

Calculation of the average chip thickness in relation with the a_e (Radial Engagement) if a_e is less than 50% of Dia.
Formula: Program Feed Rate (f_z)

$$f_z = h_m \times \sqrt{\frac{d}{a_e}}$$

h_m = Average chip thickness
 a_e = Radial engagement
 f_z = Feed per tooth
 d = Cutter diameter

Formula: Average Chip Thickness (h_m)

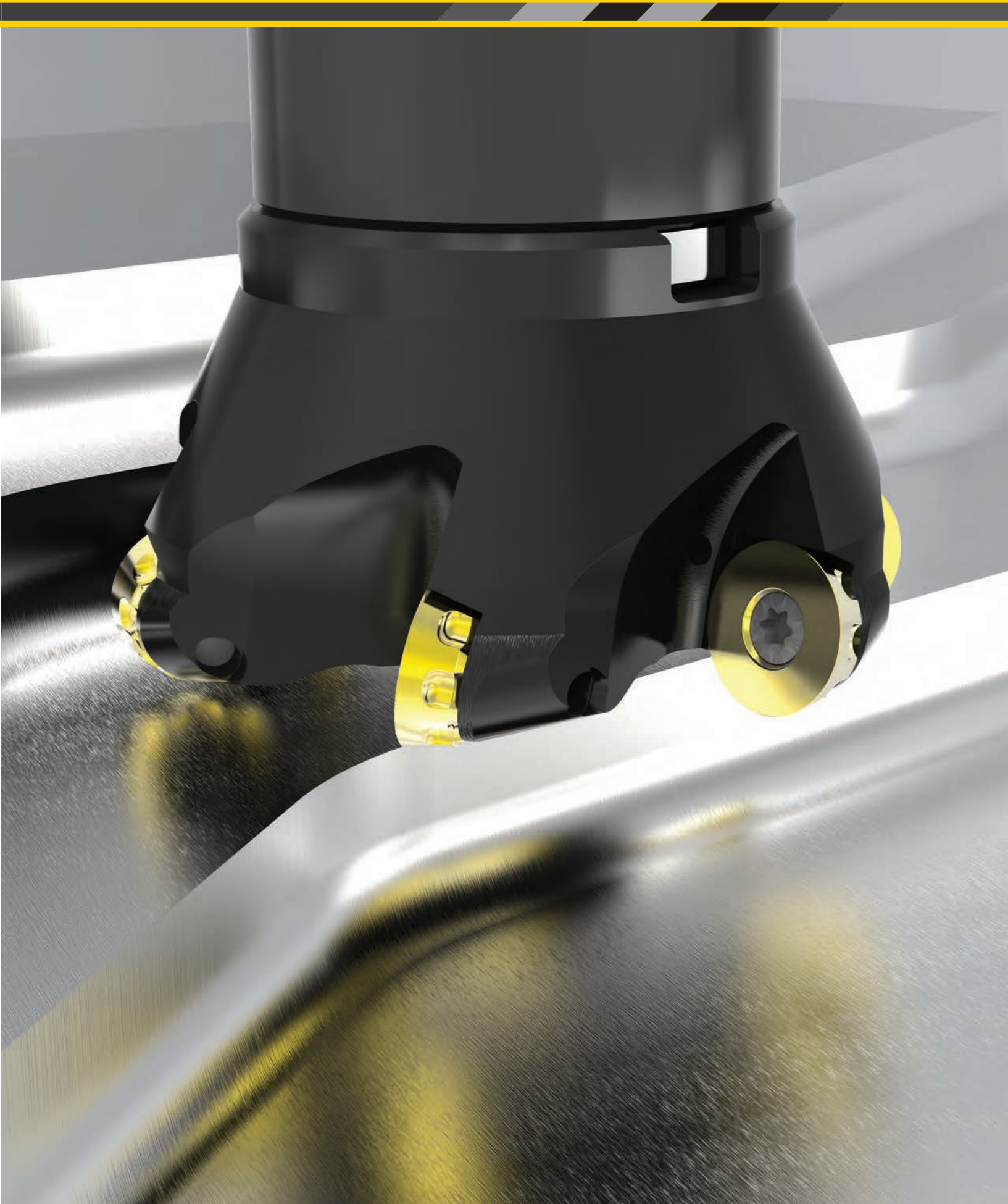
$$h_m = f_z \times \sqrt{\frac{a_e}{d}}$$

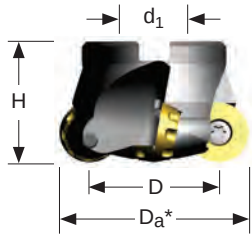


With round inserts, the thickness of the chip varies depending on the axial depth of cut and is related to the size of the cutting edge-prep.
For best tool-life it is important to maintain the proper chip thickness as shown below.
This chart calculates in relation with axial depth of cut (ap) only and not radial cut (ae).

7700VR08 Inserts RP.0803..

Dimensions (inch)						
Inserts Geometry	Insert Size	ap Axial d.o.c.	hm min.	hm max.	fz min.	fz max.
F-701	0.315	0.010	0.001	0.002	0.006	0.011
	0.315	0.020	0.001	0.002	0.004	0.008
	0.315	0.030	0.001	0.002	0.003	0.006
	0.315	0.040	0.001	0.002	0.003	0.006
	0.315	0.050	0.001	0.002	0.003	0.005
	0.315	0.060	0.001	0.002	0.002	0.005
E-701	0.315	0.010	0.001	0.002	0.006	0.011
	0.315	0.020	0.001	0.002	0.004	0.008
	0.315	0.030	0.001	0.002	0.003	0.006
	0.315	0.040	0.001	0.002	0.003	0.006
	0.315	0.050	0.001	0.002	0.003	0.005
	0.315	0.060	0.001	0.002	0.002	0.005
E-41	0.315	0.010	0.002	0.003	0.011	0.017
	0.315	0.020	0.002	0.003	0.008	0.012
	0.315	0.030	0.002	0.003	0.006	0.010
	0.315	0.040	0.002	0.003	0.006	0.008
	0.315	0.050	0.002	0.003	0.005	0.008
	0.315	0.060	0.002	0.003	0.005	0.007
E-422	0.315	0.010	0.002	0.004	0.011	0.022
	0.315	0.020	0.002	0.004	0.008	0.016
	0.315	0.030	0.002	0.004	0.006	0.013
	0.315	0.040	0.002	0.004	0.006	0.011
	0.315	0.050	0.002	0.004	0.005	0.010
	0.315	0.060	0.002	0.004	0.005	0.009



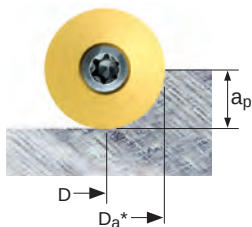


Shell Mill Fixation

Product		Dimensions (inch)							Spares					
EDP	Item Description	Da*	D Effective Cutting Diameter	H	l1	d1	ap max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.	
7710VRD20 Shell Mill Fixation														
030945	C7710VRD20A2.50Z04R	2.500	1.713	1.575	-	0.750	0.394	4	029640		D6014T	015241	T20	93.00
030668	C7710VRD20A3.00Z05R	3.000	2.213	1.969	-	1.000	0.394	5						
030664	C7710VRD20A4.00Z06R	4.000	3.213	1.969	-	1.250	0.394	6						
030667	C7710VRD20A5.00Z07R	5.000	4.213	2.480	-	1.500	0.394	7						
030666	C7710VRD20A6.00Z08R	6.000	5.213	2.480	-	1.500	0.394	8						
031077	C7710VRD20-8.50Z12R	8.500	7.713	2.480	-	2.500	0.394	12						

D = Effective Diameter (Axis) from Insert centerline to centerline

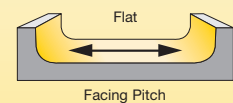
Da* = Outside Diameter

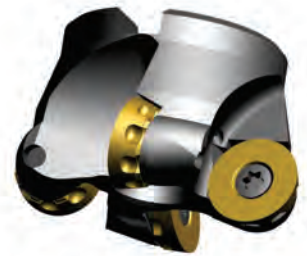
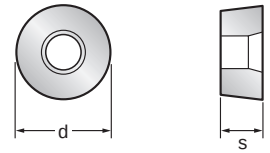
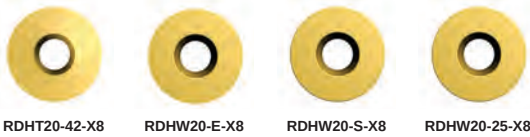


Depth of Cut (ap)

7710VRD20 Technical Information (inch)

Product		Dimensions					
EDP	Item Description	Facing Pitch	Ramping Angle °	Helical Hole min. - max.		ap max Helical / Linear	Max RPM
030945	C7710VRD20A2.50Z04R	1.713	7.30	3.504	4.921	0.260	21,700
030668	C7710VRD20A3.00Z05R	2.213	6.40	4.504	5.921	0.260	19,100
030664	C7710VRD20A4.00Z06R	3.213	4.10	6.504	7.921	0.260	15,900
030667	C7710VRD20A5.00Z07R	4.213	3.00	8.504	9.921	0.260	13,800
030666	C7710VRD20A6.00Z08R	5.213	2.40	10.504	11.921	0.260	12,400
031077	C7710VRD20-8.50Z12R	7.713	1.70	15.504	16.921	0.260	10,200





Product			Application & Material			Dimensions (inch)				
EDP	Item Description	Grade	Roughing ▼	Semi-Finishing ▼▼	Finishing ▼▼▼	d (IC)	l	s	r	h _m min
			Depth of Cut (inch)							
			a _p max 0.394*	a _p min. - max. 0.040 - 0.125	a _p min. - max. 0.008 - 0.040					
029310	RDHT2006M0E-42-X8	X500	🟡🟡🟠	🟡🟡🟠	-	0.787	-	0.250	0.394	0.003
031533	RDHT2006M0E-42-X8	SP6519	🟡🟡🟠	🟡🟡🟠	-	0.787	-	0.250	0.394	0.003
029309	RDHW2006M0E-X8	X500	-	🟡🟡🟡🟡🟡🟡🟡	-	0.787	-	0.250	0.394	0.004
031661	RDHW2006M0S-X8	X500	🟡🟡🟡	🟡🟡🟡	-	0.787	-	0.250	0.394	0.006
031662	RDHW2006M0S-X8	SP6519	🟡🟡🟡	🟡🟡🟡	-	0.787	-	0.250	0.394	0.006
031660	RDHW2006M0S-25-X8	X500	🟡🟡🟡	-	-	0.787	-	0.250	0.394	0.009
031576	RDHW2006M0S-25-X8	SP6519	🟡🟡🟡	-	-	0.787	-	0.250	0.394	0.009

Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 46.

* Max. recommended a_p = 0.300" (depending on the application)

INSERT APPLICATION NOTES:

RDHW2006M0E-X8 X500 should be your first choice for medium roughing application when machining Titanium without heavy scale.

RDHW2006M0S-X8 SP6519 should be used when machining Stainless Steel with heavy scale.

RDHW2006M0S-X8 X500 should be used when machining High Temperature Alloys with heavy scale.

RDHT2006M0E-42-X8 should be used when the machine tool has low power available and when the conditions are stable.

RDHW2006M0S-25-X8 should be used for heavy duty applications.

7710VRD20 Feeds f_z (inch/tooth)

Geometry	Grade	Operation	Unalloyed Steel	Alloyed Steel	Stainless Steel	Stainless Steel Refractory PH	Gray Iron	Spheroidal-Ductile Iron	Malleable Iron	Aluminum & Alloys <16% Si 116 HBN	Aluminum & Silicon >16% Si 92 HBN	HTA Iron Based Alloys	HTA Cobalt Based Alloys	HTA Nickel Based Alloys	HTA Titanium Based Alloys	Hard Steel >1400 N/mm ² >415 HBN	Chilled Cast Iron >1400 N/mm ² >400 HBN
			Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.
E-42-X8	X500	Facing	-	-	0.006 - 0.013	0.006 - 0.012	-	-	-	-	-	0.005 - 0.010	0.005 - 0.010	0.005 - 0.010	0.005 - 0.012	-	-
E-42-X8	SP6519	Facing	-	-	0.006 - 0.013	0.006 - 0.010	-	-	-	-	-	0.005 - 0.010	0.005 - 0.010	0.005 - 0.010	0.005 - 0.012	-	-
E-X8	X500	Facing	0.008 - 0.012	0.007 - 0.010	0.008 - 0.016	0.008 - 0.012	0.008 - 0.013	0.008 - 0.013	0.008 - 0.012	-	-	0.008 - 0.010	0.008 - 0.010	0.008 - 0.010	0.008 - 0.012	-	-
S-X8	X500	Facing	0.010 - 0.018	0.010 - 0.013	0.010 - 0.018	0.010 - 0.012	0.010 - 0.018	0.010 - 0.018	0.010 - 0.016	-	-	0.010 - 0.012	0.010 - 0.012	0.010 - 0.012	0.010 - 0.013	-	-
S-X8	SP6519	Facing	0.010 - 0.018	0.010 - 0.013	-	-	0.010 - 0.018	0.010 - 0.018	0.010 - 0.016	-	-	-	-	-	-	-	-
S-25-X8	X500	Facing	0.013 - 0.023	0.013 - 0.020	-	-	0.013 - 0.023	0.013 - 0.020	0.013 - 0.018	-	-	-	-	-	-	-	-
S-25-X8	SP6519	Facing	0.013 - 0.022	0.013 - 0.018	-	-	0.013 - 0.022	0.013 - 0.020	0.013 - 0.016	-	-	-	-	-	-	-	-

Note: HTA = High Temperature Alloys

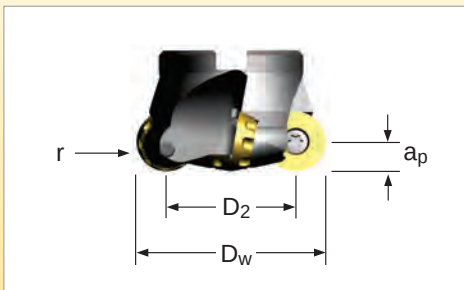
Note: Speed recommendations can be found on page 32.



Speed v_c (SFM)									
7710VRD20 Series				Wear Resistance					
				- ← → +					
Coolant Recommendation				Speed min. - max.					
Recommended ● Possible ◎				CVD X Grade		PVD Standard			
ISO	Materials	Rm and Hardness	 		X500	 		SP6519	
P	Unalloyed Steel	<600 N/mm ² <180 HBN	◎	●	425 - 885	◎	●	425 - 970	
		<950 N/mm ² <280 HBN			375 - 785			375 - 855	
	Alloyed Steel	700-950 N/mm ² 200-280 HBN	◎	●	330 - 690	◎	●	330 - 755	
		950-1200 N/mm ² 280-355 HBN			245 - 525			245 - 575	
		1200-1400 N/mm ² 355-415 HBN		●	165 - 330		●	165 - 360	
M	Stainless Steel	Austenitic + Ferritic 300 series	◎	●	375 - 820	◎	●	375 - 885	
		Martensitic 400 series			330 - 720			345 - 770	
	PH Stainless	Refractory P.H.	●		165 - 360	●		165 - 395	
K	Cast Iron	Grey GG-Ft			395 - 920			460 - 970	
		Spheroidal-Ductile GGG-FGS	◎	●	345 - 675	◎	●	360 - 785	
		Malleable GTS - MN/MP			310 - 560			330 - 720	
N	Aluminum & Alloys	Aluminum & Alloys < 16% Si 116 HBN							
		Aluminum + Silicon > 16% Si 92 HBN							
S	High Temperature Alloys	Iron Based			75 - 160			75 - 180	
		Cobalt Based			70 - 145			70 - 160	
		Nickel Based	●		80 - 170	●		80 - 180	
		Titanium Based			115 - 240			120 - 260	
H	Hard Materials	Hard Steel >1400 N/mm ² >415 HBN							
		Chilled Cast Iron >1400 N/mm ² > 400 HBN							



7710VRD20 Technical Information



Working Diameter:

Formula to evaluate the correct working diameter based on axial depth of cut (a_p).

$$D_w = D_2 + 2 \times \sqrt{r^2 - (r - a_p)^2}$$

where:

- D_w = Working Diameter
- D_2 = Diameter of cutter insert center to center
- r = Insert radius
- a_p = Axial Depth of Cut

7710VRD20 Technical Information

where:

f_z = Feed per tooth
 h_m = Average chip thickness
 r = Insert radius

a_e = Radial Depth of Cut
 a_p = Axial Depth of Cut

Formula to find programmed feed rate based on radial engagement and axial depth of cut.

$$f_z = \frac{h_m}{\frac{\sqrt{r^2 - (r - a_e)^2}}{r} \times \frac{\sqrt{r^2 - (r - a_p)^2}}{r}}$$

Formula to calculate the average chip thickness h_m in relation with radial engagement and depth of cut.

$$h_m = f_z \times \frac{\sqrt{r^2 - (r - a_e)^2}}{r} \times \frac{\sqrt{r^2 - (r - a_p)^2}}{r}$$



Simplified formulas to evaluate h_m and f_z based on axial depth of cut (a_p) or radial engagement (a_e).

Calculation of the average chip thickness in relation with the D.O.C. (Axial)

Formula: Program Feed Rate (f_z)

$$f_z = h_m \times \sqrt{\frac{d}{a_p}}$$

h_m = Average chip thickness

a_p = Depth of cut

f_z = Feed per tooth

d = Insert diameter

Formula: Average Chip Thickness (h_m)

$$h_m = f_z \times \sqrt{\frac{a_p}{d}}$$

Calculation of the average chip thickness in relation with the a_e (Radial Engagement) if a_e is less than 50% of dia.

Formula: Program Feed Rate (f_z)

$$f_z = h_m \times \sqrt{\frac{d}{a_e}}$$

h_m = Average chip thickness

a_e = Radial engagement

f_z = Feed per tooth

d = Cutter diameter

Formula: Average Chip Thickness (h_m)

$$h_m = f_z \times \sqrt{\frac{a_e}{d}}$$

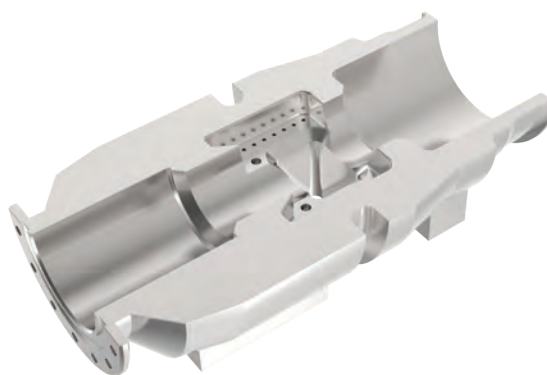
With round inserts, the thickness of the chip varies depending on the axial depth of cut (a_p) and is related to the size of the cutting edge-preparation. For best tool life it is important to maintain the proper chip thickness as shown below. This chart calculates in relation with axial depth of cut (a_p) only and not radial cut (a_e).

RD..2006..insert

Insert	Insert size (inch)	a_p d.o.c. (inch)	h_m (inch)		f_z (ipt)	
			min.	max.	min.	max.
RDHT2006M0E-X8	0.787	0.050	0.003	0.013	0.012	0.051
	0.787	0.100	0.003	0.013	0.008	0.037
	0.787	0.120	0.003	0.013	0.008	0.033
	0.787	0.150	0.003	0.013	0.007	0.030
	0.787	0.200	0.003	0.013	0.006	0.026
	0.787	0.250	0.003	0.013	0.005	0.023
	0.787	0.300	0.003	0.013	0.005	0.021
	0.787	0.394	0.003	0.013	0.004	0.018
RDHW2006M0E-X8	0.787	0.050	0.00	0.016	0.016	0.064
	0.787	0.100	0.004	0.016	0.011	0.045
	0.787	0.120	0.004	0.016	0.010	0.041
	0.787	0.150	0.004	0.016	0.009	0.037
	0.787	0.200	0.004	0.016	0.008	0.032
	0.787	0.250	0.004	0.016	0.007	0.028
	0.787	0.300	0.004	0.016	0.007	0.026
	0.787	0.394	0.004	0.016	0.006	0.023
RDHW2006M0S-X8	0.787	0.050	0.006	0.018	0.024	0.071
	0.787	0.100	0.006	0.018	0.017	0.051
	0.787	0.120	0.006	0.018	0.015	0.046
	0.787	0.150	0.006	0.018	0.014	0.041
	0.787	0.200	0.006	0.018	0.012	0.036
	0.787	0.250	0.006	0.018	0.011	0.032
	0.787	0.300	0.006	0.018	0.010	0.029
	0.787	0.394	0.006	0.018	0.009	0.025
RDHW2006M0S-25-X8	0.787	0.050	0.009	0.023	0.036	0.091
	0.787	0.100	0.009	0.023	0.025	0.065
	0.787	0.120	0.009	0.023	0.023	0.059
	0.787	0.150	0.009	0.023	0.021	0.053
	0.787	0.200	0.009	0.023	0.018	0.046
	0.787	0.250	0.009	0.023	0.016	0.041
	0.787	0.300	0.009	0.023	0.015	0.037
	0.787	0.394	0.009	0.023	0.013	0.033



77 Family Case Histories



7710 Case History

Material: 600 Series High Temperature Alloy
 Cutter: 7710VRD20 (4.0" Cutter)
 Component: Heat Exchanger Pump Housing
 Industry: Power Generation - Nuclear
 Insert Grade: X500
 RPM: 105
 Cutting Speed V_c : 110 SFM
 Feed per Tooth f_z : 0.0127"
 Feed Rate: 8.0 IPM
 Depth of Cut a_p : 0.250"

60% Reduction in Cycle Time

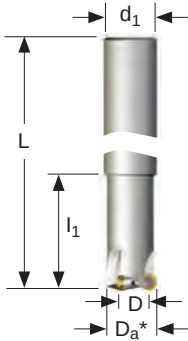
- 150% Productivity Increase
- 60% Reduction in Tooling Costs
- Zero Failures
- Zero Defects
- Finishing Operation Eliminated



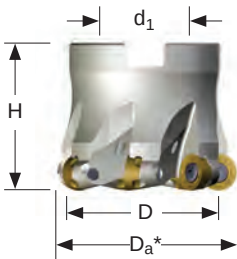
7713 Case History

Material: Stainless Steel 300 Series
 Cutter: 7713VR12 (2.50" Cutter)
 Component: Turbine Blade
 Industry: Power Generation
 Insert Grade: SP6519
 RPM: 909
 Cutting Speed V_c : 590 SFM
 Feed per Tooth f_z : 0.012"
 Feed Rate: 64 IPM
 Depth of Cut a_p : 0.087"

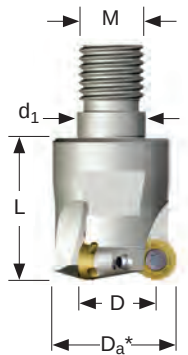
80% Increase in Tool Life!



Cylindrical Shank



Shell Mill Fixation



Modular Head



Depth of Cut (ap)

Product		Dimensions (inch)							Spares				
EDP	Item Description	Da*	D Effective Diameter	L/H	l1	d1	ap max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.
7713VR10 Cylindrical Shank - Medium and Fine Pitch													
033076	C7713VR10CA1.00Z3R2.0	1.000	0.607	7.874	1.970	1.000	0.197	3	031223	D4007T	031654	TB15	27.40
033077	C7713VR10CA1.25Z3R2.7	1.250	0.857	9.840	2.700	1.250	0.197	3	015260	D4008T	031654	TB15	27.40
033078	C7713VR10CA1.25Z4R2.7	1.250	0.857	9.840	2.700	1.250	0.197	4	015260	D4008T	031654	TB15	27.40
7713VR10 Shell Mill Fixation - Fine Pitch													
033079	C7713VR10-A1.50Z05R	1.500	1.107	1.260	-	0.500	0.197	5	015260	D4008T	031654	TB15	27.40
033080	C7713VR10-A2.00Z07R	2.000	1.607	1.570	-	0.750	0.197	7	015260	D4008T	031654	TB15	27.40
033081	C7713VR10-A2.50Z08R	2.500	2.107	1.570	-	0.750	0.197	8	015260	D4008T	031654	TB15	27.40

D = Effective Diameter (Axis) from Insert centerline to centerline

Da* = Outside Diameter

Product		Dimensions (inch)							Spares				
EDP	Item Description	Da*	D Effective Diameter	L	M	d1	ap max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.
7713VR10 Modular Head - Medium and Fine Pitch													
033082	A7713VR10SA1.00Z2R1.4	1.000	0.607	1.377	M12	0.492	0.197	2	031223	D4007T	031654	TB15	27.40
033083	A7713VR10SA1.00Z3R1.4	1.000	0.607	1.377	M12	0.492	0.197	3	031223	D4007T	031654	TB15	27.40
033084	A7713VR10SA1.25Z3R1.7	1.250	0.857	1.693	M16	0.669	0.197	3	015260	D4008T	031654	TB15	27.40
033085	A7713VR10SA1.25Z4R1.7	1.250	0.857	1.693	M16	0.669	0.197	4	015260	D4008T	031654	TB15	27.40

D = Effective Diameter (Axis) from Insert centerline to centerline

Da* = Outside Diameter

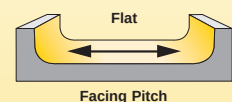
Note: For cylindrical shank extensions in high density alloy with through coolant refer to page 45.

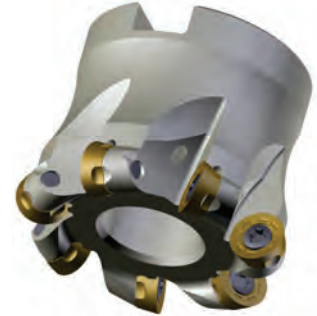
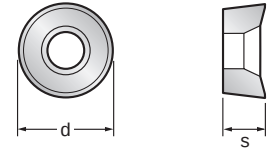
The 7713VR10 series with anti-rotation pocket ensures a precise number of indexes per insert.

This unique patented pocket design prevents the inserts from rotating in the pocket during heavy feed machining and unstable conditions.

7713VR10 Technical Information (inch)

Product		Dimensions					
EDP	Item Description	Facing Pitch	Ramping Angle °	Helical Hole min. - max.		ap max Helical / Linear	Max RPM
033076	C7713VR10CA1.00Z3R2.0	0.607	5.13	1.291	1.921	0.130	64,000
033077	C7713VR10CA1.25Z3R2.7	0.857	8.68	1.791	2.421	0.130	53,500
033078	C7713VR10CA1.25Z4R2.7	0.857	8.68	1.791	2.421	0.130	53,500
033079	C7713VR10-A1.50Z05R	1.107	7.75	2.291	2.921	0.130	47,000
033080	C7713VR10-A2.00Z07R	1.607	5.10	3.291	3.921	0.130	39,500
033081	C7713VR10-A2.50Z08R	2.107	3.70	4.291	4.921	0.130	34,000
033082	A7713VR10SA1.00Z2R1.4	0.607	5.13	1.291	1.921	0.130	64,000
033083	A7713VR10SA1.00Z3R1.4	0.607	5.13	1.291	1.921	0.130	64,000
033084	A7713VR10SA1.25Z3R1.7	0.857	8.68	1.791	2.421	0.130	53,500
033085	A7713VR10SA1.25Z4R1.7	0.857	8.68	1.791	2.421	0.130	53,500





Product			Application & Material			Dimensions (inch)				
EDP	Item Description	Grade	Roughing ▼	Semi-Finishing ▼▼	Finishing ▼▼▼	d (IC)	l	s	r	h _m min
			Depth of Cut (inch)							
			a _p max 0.197*	a _p min. - max. 0.040 - 0.080	a _p min. - max. 0.008 - 0.040					
030546	RPEX10T3M0F-701-X4	SP4019	■	■	■◆	0.394	-	0.156	0.197	0.001
030456	RPEX10T3M0F-701-X4	GH1	◆	◆	◆	0.394	-	0.156	0.197	0.001
030545	RPEX10T3M0E-701-X4	SP6519	-	-	■	0.394	-	0.156	0.197	0.001
030449	RPHT10T3M0E-421-X4	X500	-	●	-	0.394	-	0.156	0.197	0.002
030410	RPHT10T3M0E-421-X4	X700	-	-	●	0.394	-	0.156	0.197	0.002
030452	RPMT10T3M0E-41-X4	X500	-	●	-	0.394	-	0.156	0.197	0.002
031539	RPMT10T3M0E-41-X4	SP6519	-	-	■□●●	0.394	-	0.156	0.197	0.002
030451	RPMT10T3M0E-41-X4	MP91M	-	■	●●◆	0.394	-	0.156	0.197	0.002
030697	RPHT10T3M0E422-X4	X500	■◆◆	■◆◆	●	0.394	-	0.156	0.197	0.002
030767	RPHT10T3M0E-422-X4	X700	●●●	●	◆◆	0.394	-	0.156	0.197	0.002
030862	RPHT10T3M0E-422-X4	SP6519	●●◆□●■	●●◆□●■	◆◆□■	0.394	-	0.156	0.197	0.002
030329	RPHT10T3M0T-X4	X500	■□	■□	-	0.394	-	0.156	0.197	0.003
031555	RPHT10T3M0T-X4	SP6519	◆◆◆	◆◆◆	-	0.394	-	0.156	0.197	0.003
030454	RPMW10T3M0T-X4	X500	◆◆◆◆◆	◆◆◆◆◆	-	0.394	-	0.156	0.197	0.005

Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 46.

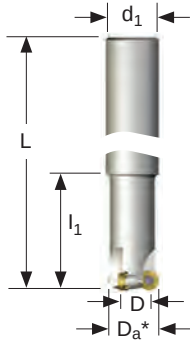
RPMW10T3M0T-X4 X500 should be used for materials with heavy scale.

Max. recommended a_p = 0.100" (depending on the application)

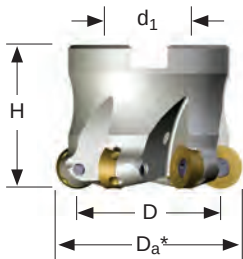
7713VR10 Feeds f_z (inch/tooth)

Geometry	Grade	Operation	Unalloyed Steel	Alloyed Steel	Stainless Steel	Stainless Steel Refractory PH	Gray Iron	Spheroidal-Ductile Iron	Malleable Iron	Aluminum & Alloys <16% Si 116 HBN	Aluminum & Silicon >16% Si 92 HBN	HTA Iron Based Alloys	HTA Cobalt Based Alloys	HTA Nickel Based Alloys	HTA Titanium Based Alloys	Hard Steel >1400 N/mm ² >415 HBN	Chilled Cast Iron >1400 N/mm ² >400 HBN
			Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.
F-701-X4	SP4019	Contouring	-	-	-	-	-	-	-	0.001 - 0.004	0.001 - 0.003	0.001 - 0.003	0.001 - 0.003	0.002 - 0.003	0.003 - 0.004	-	-
F-701-X4	GH1	Contouring	-	-	-	-	-	-	-	0.001 - 0.004	0.001 - 0.003	-	-	-	-	-	-
E-701-X4	SP6519	Contouring	-	-	-	-	-	-	-	-	-	0.001 - 0.003	0.001 - 0.003	0.002 - 0.003	0.001 - 0.004	-	-
E-421-X4	X500	Contouring	-	-	-	-	-	-	-	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.004	0.002 - 0.004	-	-
E-421-X4	X700	Contouring	-	-	-	-	-	-	-	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.004	0.002 - 0.004	-	-
E-41-X4	X500	Contouring	-	-	0.002 - 0.007	-	-	-	-	-	-	-	-	-	-	-	-
E-41-X4	SP6519	Contouring	0.002 - 0.007	0.002 - 0.006	0.002 - 0.007	-	0.002 - 0.007	0.04 - 0.007	0.002 - 0.006	-	-	-	-	-	-	-	-
E-41-X4	MP91M	Contouring	0.002 - 0.007	0.002 - 0.006	-	-	0.002 - 0.006	0.04 - 0.006	0.002 - 0.005	-	-	-	-	-	-	-	-
E-422-X4	X500	Contouring	-	-	0.002 - 0.012	0.002 - 0.010	-	-	-	-	-	0.002 - 0.006	0.002 - 0.006	0.002 - 0.006	0.002 - 0.007	-	-
E-422-X4	X700	Contouring	-	-	0.002 - 0.011	0.002 - 0.009	-	-	-	-	-	0.002 - 0.005	0.002 - 0.005	0.002 - 0.006	0.002 - 0.006	-	-
E-422-X4	SP6519	Contouring	0.002 - 0.012	0.002 - 0.010	0.002 - 0.011	0.002 - 0.009	0.002 - 0.010	0.06 - 0.010	0.002 - 0.009	-	-	0.002 - 0.005	0.002 - 0.005	0.002 - 0.006	0.002 - 0.006	-	-
T-X4	X500	Contouring	0.003 - 0.013	0.003 - 0.011	-	-	-	-	-	-	-	-	-	-	-	-	-
T-X4	SP6519	Contouring	0.003 - 0.013	0.003 - 0.011	-	-	0.003 - 0.012	0.008 - 0.012	0.003 - 0.011	-	-	-	-	-	-	-	-
T-X4	X500	Contouring	0.005 - 0.014	0.005 - 0.013	0.005 - 0.012	0.005 - 0.012	-	-	-	-	-	0.005 - 0.007	0.005 - 0.007	0.005 - 0.008	0.005 - 0.009	-	-

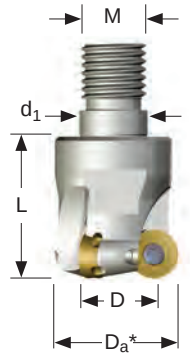
Speed recommendations can be found on page 41.



Cylindrical Shank



Shell Mill Fixation



Modular Head



Depth of Cut (ap)

Product		Dimensions (inch)							Spares				
EDP	Item Description	Da*	D Effective Diameter	L/H	l1	d1	ap max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.

7713VR12 Cylindrical Shank

033086	C7713VR12CA1.00Z2R2.0	1.000	0.528	7.874	1.968	1.000	0.236	2	015260	D4008T	015240	T15	27.40
033087	C7713VR12CA1.25Z3R2.7	1.250	0.778	9.842	2.755	1.250	0.236	3	015260	D4008T	015240	T15	27.40

7713VR12 Shell Mill Fixation - Medium and Fine Pitch

033088	C7713VR12-A1.50Z4R	1.500	1.028	1.574	-	0.500	0.236	4	015262	D4010T	015240	T15	27.40
033089	C7713VR12-A1.50Z5R	1.500	1.028	1.574	-	0.500	0.236	5	015262	D4010T	031654	TB15	27.40
033090	C7713VR12-A2.00Z4R	2.000	1.528	1.574	-	0.750	0.236	4	015262	D4010T	015240	T15	27.40
033091	C7713VR12-A2.00Z5R	2.000	1.528	1.574	-	0.750	0.236	5	015262	D4010T	015240	T15	27.40
033092	C7713VR12-A2.00Z6R	2.000	1.528	1.574	-	0.750	0.236	6	015262	D4010T	031654	TB15	27.40
033093	C7713VR12-A2.50Z6R	2.500	2.028	1.986	-	0.750	0.236	6	015262	D4010T	015240	T15	27.40
033094	C7713VR12-A2.50Z7R	2.500	2.028	1.986	-	0.750	0.236	7	015262	D4010T	031654	TB15	27.40
033095	C7713VR12-A3.00Z8R	3.000	2.528	1.986	-	1.000	0.236	8	015262	D4010T	015240	T15	27.40

D = Effective Diameter (Axis) from Insert centerline to centerline

Da* = Outside Diameter

Product		Dimensions (inch)							Spares				
EDP	Item Description	Da*	D Effective Diameter	L	M	d1	ap max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.

7713VR12 Modular Head - Medium and Fine Pitch

033096	A7713VR12SA1.00Z2R1.4	1.000	0.528	1.377	M12	0.472	0.236	2	015260	D4008T	015240	T15	27.40
033097	A7713VR12SA1.25Z3R1.7	1.250	0.778	1.692	M16	0.669	0.236	3	015260	D4008T	015240	T15	27.40
033098	A7713VR12SA1.50Z4R1.7	1.500	1.028	1.692	M16	0.669	0.236	4	015260	D4008T	015240	T15	27.40
033099	A7713VR12SA1.50Z5R1.7	1.500	1.028	1.692	M16	0.669	0.236	5	015260	D4008T	031654	TB15	27.40

D = Effective Diameter (Axis) from Insert centerline to centerline

Da* = Outside Diameter

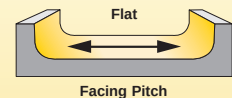
Note: For cylindrical shank extensions in high density alloy with through coolant refer to page 45.

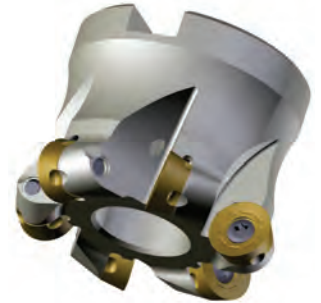
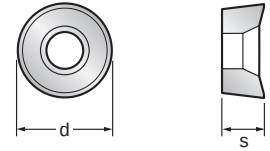
The 7713VR12 series with anti-rotation pocket ensures a precise number of indexes per insert.

This unique patented pocket design prevents the inserts from rotating in the pocket during heavy feed machining and unstable conditions.

7713VR12 Technical Information (inch)

Product		Dimensions					
EDP	Item Description	Facing Pitch	Ramping Angle °	Helical Hole min. - max.		ap max Helical / Linear	Max RPM
033086	C7713VR12CA1.00Z2R2.0	0.528	9.50	1.134	1.921	0.160	49,000
033087	C7713VR12CA1.25Z3R2.7	0.778	12.40	1.634	2.421	0.160	40,500
033088	C7713VR12-A1.50Z4R	1.028	8.60	2.134	2.921	0.160	35,000
033089	C7713VR12-A1.50Z5R	1.028	8.60	2.134	2.921	0.160	35,000
033090	C7713VR12-A2.00Z4R	1.528	5.50	3.134	3.921	0.160	28,500
033091	C7713VR12-A2.00Z5R	1.528	5.50	3.134	3.921	0.160	28,500
033092	C7713VR12-A2.00Z6R	1.528	5.50	3.134	3.921	0.160	28,500
033093	C7713VR12-A2.50Z6R	2.028	3.90	4.134	4.921	0.160	25,000
033094	C7713VR12-A2.50Z7R	2.028	3.90	4.134	4.921	0.160	25,000
033095	C7713VR12-A3.00Z8R	2.528	2.95	5.134	5.921	0.160	22,500
033096	A7713VR12SA1.00Z2R1.4	0.528	9.50	1.134	1.921	0.160	49,000
033097	A7713VR12SA1.25Z3R1.7	0.778	12.40	1.634	2.421	0.160	40,500
033098	A7713VR12SA1.50Z4R1.7	1.028	8.60	2.134	2.921	0.160	35,000
033099	A7713VR12SA1.50Z5R1.7	1.028	8.60	2.134	2.921	0.160	35,000





Product			Application & Material			Dimensions (inch)				
EDP	Item Description	Grade	Roughing ▼	Semi-Finishing ▼▼	Finishing ▼▼▼	d (IC)	l	s	r	h _m min
			Depth of Cut (inch)							
			a _p max 0.197	a _p min. - max. 0.040 - 0.080	a _p min. - max. 0.008 - 0.040					
029284	RPEX1204M0F-701-X4	GH1	◆	◆	◆	0.472	-	0.187	0.236	0.001
029282	RPEX1204M0E-701-X4	X500	-	-	●	0.472	-	0.187	0.236	0.002
029286	RPHT1204M0E-421-X4	X500	-	●	■	0.472	-	0.187	0.236	0.002
029700	RPHT1204M0E-421-X4	X700	-	-	◆◆◆	0.472	-	0.187	0.236	0.002
029272	RPMT1204M0E-41-X4	X500	●	●	-	0.472	-	0.187	0.236	0.002
031517	RPMT1204M0E-41-X4	SP6519	-	■ ■ ●	● ● ●	0.472	-	0.187	0.236	0.002
029291	RPMT1204M0E-41-X4	MP91M	-	■	● ● ■	0.472	-	0.187	0.236	0.002
032129	RPHT1204M0E-442-X4	X500	◆◆◆	◆◆◆	-	0.472	-	0.187	0.236	0.002
032130	RPHT1204M0E-442-X4	X700	●	● ●	● ●	0.472	-	0.187	0.236	0.002
032128	RPHT1204M0E-442-X4	SP6519	◆ ◆ ■	◆ ◆ ◆ ■ ■	◆ ◆ ◆ ■ ■	0.472	-	0.187	0.236	0.002
029034	RPHT1204M0T-X4	X500	●	-	-	0.472	-	0.187	0.236	0.004
029699	RPHT1204M0T-X4	X700	●	-	-	0.472	-	0.187	0.236	0.004
031516	RPHT1204M0T-X4	SP6519	● ■ ●	-	-	0.472	-	0.187	0.236	0.004
029295	RPMW1204M0T-X4	X500	◆◆◆	-	-	0.472	-	0.187	0.236	0.005
031518	RPMW1204M0T-X4	SP6519	■ ◆ ■	-	-	0.472	-	0.187	0.236	0.005
029294	RPMW1204M0T-X4	MP91M	◆ ◆	-	◆	0.472	-	0.187	0.236	0.005

Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 46.

RPMW1204M0T-X4 should be used for materials with heavy scale.

* Max. recommended a_p = 0.140" (depending on the application)

Note: Feed recommendations can be found on page 40. Speed recommendations can be found on page 41.



7713VR12 Feeds f_z (inch/tooth)

Geometry	Grade	Operation	Unalloyed Steel	Alloyed Steel	Stainless Steel	Stainless Steel Refractory PH	Gray Iron	Spheroidal-Ductile Iron	Malleable Iron	Aluminum & Alloys <16% Si 116 HBN	Aluminum & Silicon >16% Si 92 HBN	HTA Iron Based Alloys	HTA Cobalt Based Alloys	HTA Nickel Based Alloys	HTA Titanium Based Alloys	Hard Steel >1400 N/mm ² >415 HBN	Chilled Cast Iron >1400 N/mm ² >400 HBN
			Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.
F-701-X4	GH1	Contouring	-	-	-	-	-	-	-	0.001 - 0.005	0.001 - 0.004	-	-	-	-	-	-
E-701-X4	X500	Contouring	-	-	-	-	-	-	-	-	-	0.001 - 0.003	0.001 - 0.003	0.001 - 0.004	0.001 - 0.004	-	-
E-421-X4	X500	Contouring	-	-	-	-	-	-	-	-	-	0.002 - 0.008	0.002 - 0.008	0.002 - 0.009	0.002 - 0.010	-	-
E-421-X4	X700	Contouring	-	-	0.002 - 0.010	0.002 - 0.005	-	-	-	-	-	0.002 - 0.008	0.002 - 0.008	0.002 - 0.008	0.002 - 0.009	-	-
E-41-X4	X500	Contouring	-	0.002 - 0.009	0.002 - 0.010	-	-	-	-	-	-	-	-	-	-	-	-
E-41-X4	SP6519	Contouring	0.002 - 0.010	0.002 - 0.009	-	-	0.002 - 0.010	0.002 - 0.010	0.002 - 0.008	-	-	-	-	-	-	-	-
E-41-X4	MP91M	Contouring	0.002 - 0.010	0.002 - 0.009	-	-	0.002 - 0.010	0.002 - 0.010	0.002 - 0.008	-	-	-	-	-	-	-	-
E-442-X4	X500	Contouring	-	-	0.002 - 0.016	0.002 - 0.013	-	-	-	-	-	0.002 - 0.010	0.002 - 0.010	0.002 - 0.010	0.002 - 0.010	-	-
E-442-X4	X700	Contouring	-	-	0.002 - 0.015	0.002 - 0.012	-	-	-	-	-	0.002 - 0.009	0.002 - 0.009	0.002 - 0.009	0.002 - 0.010	-	-
E-442-X4	SP6519	Contouring	0.002 - 0.018	0.002 - 0.015	0.002 - 0.015	0.002 - 0.012	0.002 - 0.016	0.002 - 0.016	0.002 - 0.014	-	-	0.002 - 0.009	0.002 - 0.009	0.002 - 0.009	0.002 - 0.010	-	-
RPHT-T-X4	X500	Contouring	-	0.006 - 0.016	-	-	-	-	-	-	-	-	-	-	-	-	-
RPHT-T-X4	X700	Contouring	-	-	-	0.006 - 0.014	-	-	-	-	-	-	-	-	-	-	-
RPHT-T-X4	SP6519	Contouring	0.006 - 0.018	0.006 - 0.016	-	-	0.006 - 0.018	0.006 - 0.018	0.006 - 0.016	-	-	-	-	-	-	-	-
RPMW-T-X4*	X500	Contouring	-	-	0.005 - 0.014	0.005 - 0.011	-	-	-	-	-	0.005 - 0.010	0.005 - 0.010	0.005 - 0.011	0.005 - 0.011	-	-
RPMW-T-X4*	SP6519	Contouring	0.005 - 0.018	0.005 - 0.016	-	-	0.005 - 0.018	0.005 - 0.018	0.005 - 0.016	-	-	-	-	-	-	-	-
RPMW-T-X4*	MP91M	Contouring	0.005 - 0.017	-	-	-	0.005 - 0.017	0.005 - 0.017	0.005 - 0.014	-	-	-	-	-	-	0.004 - 0.006	0.004 - 0.006

Note: HTA = High Temperature Alloys

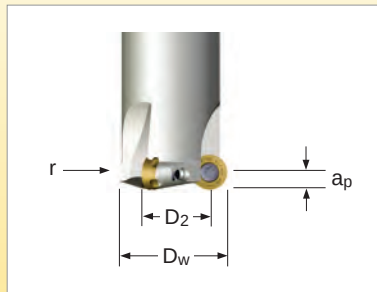
Speed recommendations can be found on page 41.



Speed v_c (SFM)													
7713VR Series			Wear Resistance										
			- ← → +										
			Speed min. - max.										
Coolant Recommendation													
Recommended ● Possible ◎													
ISO	Materials	Rm and Hardness	CVD X Grade		PVD X Grade		PVD Standard		PVD Standard		CVD Standard		Uncoated Micrograin
			ⓘ ⓘ	Ⓢ	ⓘ ⓘ	Ⓢ	ⓘ ⓘ	Ⓢ	ⓘ ⓘ	Ⓢ	ⓘ ⓘ	Ⓢ	
P	Unalloyed Steel	<600 N/mm ² <180 HBN	◎	●	425 - 885		◎	●	425 - 970	●	460 - 1035	●	460 - 1130
		<950 N/mm ² <280 HBN			375 - 785				375 - 855		395 - 900		395 - 1000
	Alloyed Steel	700-950 N/mm ² 200-280 HBN	◎	●	330 - 690		◎	●	330 - 755	●	345 - 805	●	345 - 885
		950-1200 N/mm ² 280-355 HBN			245 - 525				245 - 575		260 - 625		260 - 675
M	Stainless Steel	1200-1400 N/mm ² 355-415 HBN		●	165 - 330			●	165 - 360	●	165 - 395	●	165 - 425
		Austenitic + Ferritic 300 series	◎	●	375 - 820	◎	●	375 - 855	◎	●	375 - 885		
	PH Stainless	Martensitic 400 series			330 - 720			345 - 755			345 - 770		
		Refractory P.H.	●		165 - 360	●		165 - 375	●		165 - 395	●	165 - 425
K	Cast Iron	Grey GG-Ft						460 - 970				475 - 1200	
		Spheroidal-Ductile GGG-FGS					◎	●	360 - 785		●	375 - 935	
		Malleable GTS - MN/MP						330 - 720				345 - 855	
N	Aluminum & Alloys	Aluminum & Alloys < 16% Si 116 HBN							●	1310 - 9500		●	1310 - 10005
		Aluminum + Silicon > 16% Si 92 HBN								970 - 7615			970 - 8005
S	High Temperature Alloys	Iron Based			75 - 160			75 - 170		75 - 180		80 - 210	
		Cobalt Based			70 - 145			70 - 150		70 - 160		75 - 170	
		Nickel Based	●		80 - 170	●		80 - 175	●	80 - 180		85 - 190	
		Titanium Based			115 - 240			120 - 250		120 - 260		120 - 275	
H	Hard Materials	Hard Steel >1400 N/mm ² >415 HBN									●	165 - 345	
		Chilled Cast Iron >1400 N/mm ² > 400 HBN										130 - 310	



7713VR Technical Information



Working Diameter:

Formula to evaluate the correct working diameter based on axial depth of cut (a_p).

$$D_w = D_2 + 2 \times \sqrt{r^2 - (r - a_p)^2}$$

where: D_w = Working Diameter
 D_2 = Diameter of cutter insert center to center
 r = Insert radius
 a_p = Axial Depth of Cut

7713VR Technical Information

Formula to find programmed feed rate based on radial engagement and axial depth of cut.

$$f_z = \frac{h_m}{\frac{\sqrt{r^2 - (r - a_e)^2}}{r} \times \frac{\sqrt{r^2 - (r - a_p)^2}}{r}}$$

where:

f_z = Feed per tooth
 h_m = Average chip thickness
 r = Insert radius
 a_e = Radial Depth of Cut
 a_p = Axial Depth of Cut

Formula to calculate the average chip thickness h_m in relation with radial engagement and depth of cut.

$$h_m = f_z \times \frac{\sqrt{r^2 - (r - a_e)^2}}{r} \times \frac{\sqrt{r^2 - (r - a_p)^2}}{r}$$

Simplified formulas to evaluate h_m and f_z based on radial engagement or depth of cut.

Calculation of the average chip thickness in relation with the D.O.C. (Axial)

Formula: Program Feed Rate (f_z)

$$f_z = h_m \times \sqrt{\frac{d}{a_p}}$$

h_m = Average chip thickness

a_p = Depth of cut

f_z = Feed per tooth

d = Insert diameter

Formula: Average Chip Thickness (h_m)

$$h_m = f_z \times \sqrt{\frac{a_p}{d}}$$

Calculation of the average chip thickness in relation with the a_e (Radial Engagement) if a_e is less than 50% of Dia.

Formula: Program Feed Rate (f_z)

$$\sqrt{\frac{d}{a_e}}$$

h_m = Average chip thickness

a_e = Radial engagement

f_z = Feed per tooth

d = Cutter diameter

Formula: Average Chip Thickness (h_m)

$$h_m = f_z \times \sqrt{\frac{a_e}{d}}$$



With round inserts, the thickness of the chip varies depending on the axial depth of cut and is related to the size of the cutting edge preparation. For best tool-life it is important to maintain the proper chip thickness as shown below.

Inserts RP..10T3..

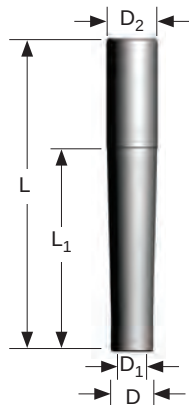
Dimensions (inch)						
Inserts Geometry	Insert Size	ap Axial d.o.c.	hm min.	hm max.	fz min.	fz max.
F-701-X4	0.394	0.010	0.001	0.002	0.006	0.013
	0.394	0.020	0.001	0.002	0.004	0.009
	0.394	0.040	0.001	0.002	0.003	0.006
	0.394	0.060	0.001	0.002	0.003	0.005
	0.394	0.080	0.001	0.002	0.002	0.004
	0.394	0.100	0.001	0.002	0.002	0.004
E-701-X4	0.394	0.010	0.001	0.003	0.006	0.019
	0.394	0.020	0.001	0.003	0.004	0.013
	0.394	0.040	0.001	0.003	0.003	0.009
	0.394	0.060	0.001	0.003	0.003	0.008
	0.394	0.080	0.001	0.003	0.002	0.007
	0.394	0.100	0.001	0.003	0.002	0.006
E-421-X4	0.394	0.010	0.002	0.003	0.013	0.019
	0.394	0.020	0.002	0.003	0.009	0.013
	0.394	0.040	0.002	0.003	0.006	0.009
	0.394	0.060	0.002	0.003	0.005	0.008
	0.394	0.080	0.002	0.003	0.004	0.007
	0.394	0.100	0.002	0.003	0.004	0.006
E-41-X4	0.394	0.010	0.002	0.004	0.013	0.025
	0.394	0.020	0.002	0.004	0.009	0.018
	0.394	0.040	0.002	0.004	0.006	0.013
	0.394	0.060	0.002	0.004	0.005	0.010
	0.394	0.080	0.002	0.004	0.004	0.009
	0.394	0.100	0.002	0.004	0.004	0.008
E-422-X4	0.394	0.010	0.002	0.005	0.013	0.031
	0.394	0.020	0.002	0.005	0.009	0.022
	0.394	0.040	0.002	0.005	0.006	0.016
	0.394	0.060	0.002	0.005	0.005	0.013
	0.394	0.080	0.002	0.005	0.004	0.011
	0.394	0.100	0.002	0.005	0.004	0.010
RPHT-T-X4	0.394	0.010	0.003	0.005	0.019	0.031
	0.394	0.020	0.003	0.005	0.013	0.022
	0.394	0.040	0.003	0.005	0.009	0.016
	0.394	0.060	0.003	0.005	0.008	0.013
	0.394	0.080	0.003	0.005	0.007	0.011
	0.394	0.100	0.003	0.005	0.006	0.010
RPMW-T-X4	0.394	0.010	0.004	0.006	0.025	0.038
	0.394	0.020	0.004	0.006	0.018	0.027
	0.394	0.040	0.004	0.006	0.013	0.019
	0.394	0.060	0.004	0.006	0.010	0.015
	0.394	0.080	0.004	0.006	0.009	0.013
	0.394	0.100	0.004	0.006	0.008	0.012



With round inserts, the thickness of the chip varies depending on the axial depth of cut and is related to the size of the cutting edge preparation. For best tool-life it is important to maintain the proper chip thickness as shown below.

Inserts RP.1204..

Dimensions (inch)						
Inserts Geometry	Insert Size	a_p Axial d.o.c.	h_m min.	h_m max.	f_z min.	f_z max.
F-701-X4	0.472	0.010	0.001	0.004	0.007	0.027
	0.472	0.020	0.001	0.004	0.005	0.019
	0.472	0.040	0.001	0.004	0.003	0.014
	0.472	0.060	0.001	0.004	0.003	0.011
	0.472	0.080	0.001	0.004	0.002	0.010
	0.472	0.100	0.001	0.004	0.002	0.009
	0.472	0.120	0.001	0.004	0.002	0.008
	0.472	0.140	0.001	0.004	0.002	0.007
E-701-X4	0.472	0.010	0.001	0.005	0.007	0.034
	0.472	0.020	0.001	0.005	0.005	0.024
	0.472	0.040	0.001	0.005	0.003	0.017
	0.472	0.060	0.001	0.005	0.003	0.014
	0.472	0.080	0.001	0.005	0.002	0.012
	0.472	0.100	0.001	0.005	0.002	0.011
	0.472	0.120	0.001	0.005	0.002	0.010
	0.472	0.140	0.001	0.005	0.002	0.009
E-421-X4	0.472	0.010	0.002	0.006	0.014	0.041
	0.472	0.020	0.002	0.006	0.010	0.029
	0.472	0.040	0.002	0.006	0.007	0.021
	0.472	0.060	0.002	0.006	0.006	0.017
	0.472	0.080	0.002	0.006	0.005	0.015
	0.472	0.100	0.002	0.006	0.004	0.013
	0.472	0.120	0.002	0.006	0.004	0.012
	0.472	0.140	0.002	0.006	0.004	0.011
E-41-X4	0.472	0.010	0.002	0.006	0.014	0.041
	0.472	0.020	0.002	0.006	0.010	0.029
	0.472	0.040	0.002	0.006	0.007	0.021
	0.472	0.060	0.002	0.006	0.006	0.017
	0.472	0.080	0.002	0.006	0.005	0.015
	0.472	0.100	0.002	0.006	0.004	0.013
	0.472	0.120	0.002	0.006	0.004	0.012
	0.472	0.140	0.002	0.006	0.004	0.011
E-442-X4	0.472	0.010	0.002	0.008	0.014	0.055
	0.472	0.020	0.002	0.008	0.010	0.039
	0.472	0.040	0.002	0.008	0.007	0.027
	0.472	0.060	0.002	0.008	0.006	0.022
	0.472	0.080	0.002	0.008	0.005	0.019
	0.472	0.100	0.002	0.008	0.004	0.017
	0.472	0.120	0.002	0.008	0.004	0.016
	0.472	0.140	0.002	0.008	0.004	0.015
RPHT-T-X4	0.472	0.010	0.004	0.008	0.027	0.055
	0.472	0.020	0.004	0.008	0.019	0.039
	0.472	0.040	0.004	0.008	0.014	0.027
	0.472	0.060	0.004	0.008	0.011	0.022
	0.472	0.080	0.004	0.008	0.010	0.019
	0.472	0.100	0.004	0.008	0.009	0.017
	0.472	0.120	0.004	0.008	0.008	0.016
	0.472	0.140	0.004	0.008	0.007	0.015
RPMW-T-X4	0.472	0.010	0.005	0.009	0.034	0.062
	0.472	0.020	0.005	0.009	0.024	0.044
	0.472	0.040	0.005	0.009	0.017	0.031
	0.472	0.060	0.005	0.009	0.014	0.025
	0.472	0.080	0.005	0.009	0.012	0.022
	0.472	0.100	0.005	0.009	0.011	0.020
	0.472	0.120	0.005	0.009	0.010	0.018
	0.472	0.140	0.005	0.009	0.009	0.017



Shank Extension

Product		Dimensions (inch)					
EDP	Item Description	L	L ₁	D ₂	D	D ₁	M
030641	M-13-M8-CA.625-3.543	3.543	1.600	0.625	0.512	0.335	M8
030642	M-13-M8-CA.625-4.331	4.331	2.500	0.625	0.512	0.335	M8
030643	M-13-M8-CA.625-5.118	5.118	3.000	0.625	0.512	0.335	M8
030644	M-13-M8-CA.625-6.693	6.693	4.750	0.625	0.512	0.335	M8
030645	M-18-M10-CA.750-4.331	4.331	2.500	0.750	0.709	0.413	M10
030646	M-18-M10-CA.750-5.118	5.118	3.000	0.750	0.709	0.413	M10
030647	M-18-M10-CA.750-6.693	6.693	4.750	0.750	0.709	0.413	M10
030648	M-21-M12-CA1-5.157	5.157	3.000	1.000	0.827	0.492	M12
030649	M-21-M12-CA1-6.142	6.142	4.000	1.000	0.827	0.492	M12
030650	M-21-M12-CA1-7.126	7.126	5.000	1.000	0.827	0.492	M12
030651	M-21-M12-CA1-8.110	8.110	6.000	1.000	0.827	0.492	M12
030652	M-21-M12-CA1-9.094	9.094	7.000	1.000	0.827	0.492	M12
030653	M-29-M16-CA1.25-6.3	6.300	4.000	1.250	1.411	0.669	M16
030654	M-29-M16-CA1.25-8.27	8.268	6.000	1.250	1.411	0.669	M16
030655	M-29-M16-CA1.25-10.2	10.236	8.000	1.250	1.411	0.669	M16
030656	M-29-M16-CA1.25-12.2	12.205	10.000	1.250	1.411	0.669	M16

Note: Order example with cylindrical shank: M-13-M8-CA.625-3.543



Cylindrical shank extensions can be used with all modular heads found in several product family series within this catalog.

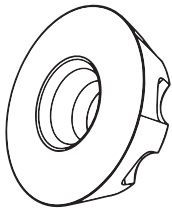
These extensions have the industry standard of metric threads.

Technical Advice

M	Modular adapter
13	Diameter in front of the modular shank (D) 0.512" (13mm)
M8	Metric Thread (M)
CA.625	Cylindrical shank diameter 0.625" with through coolant
3.543	Total length of the body in Inches

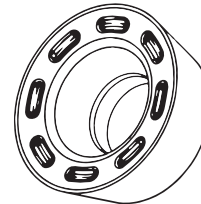


77 Family Geometries



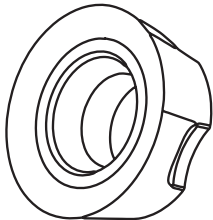
-25 

This geometry is specifically designed for heavy roughing applications and is the first choice for Steels and Cast Iron.



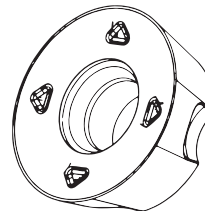
-422 

This positive geometry features an 11° chip angle and an “E” edge preparation for roughing and semi finishing applications in difficult to machine materials.



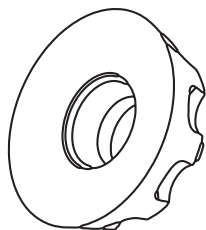
-41 

This general purpose utility geometry has a positive cutting action and reinforced cutting edge for medium roughing and semi-finishing applications.



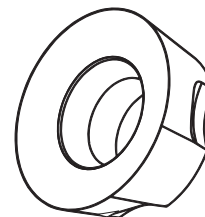
-442 

This NEW positive roughing and semi-finishing geometry features an 11° chip angle and an “E” edge preparation to minimize the pressure from chip formation.



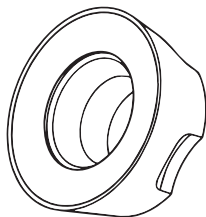
-42 

This general purpose roughing and semi-finishing geometry features a positive rake and T-land to create a strong cutting edge designed to withstand high cutting forces and interrupted cuts.



-701 

This precision ground extreme high positive geometry is especially suitable for finishing a wide range of materials at low feed rates and delivers excellent performance when machining thin-walled components.



-421 

This high positive geometry features high accuracy periphery grinding for precise control of the cutting edge. For semi-finishing and finishing applications.

Tool	-25	-41	-42	-421	-422	-442	-701
7700VR08		•			•		•
7710VRD20	•		•				
7713VR10		•		•	•		•
7713VR12		•		•		•	•

Material Guide – Key to Recommended Inserts

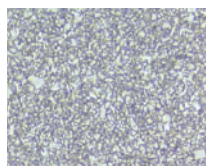
Material Designation

 Unalloyed Steels
  Alloyed Steels
  Stainless Steels
  PH Stainless
  Cast Irons
  Aluminum & Alloys
  High Temp. Alloys
  Hard Materials



77 Family Grades

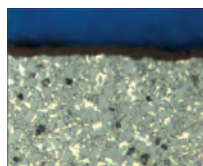
Tool	GH1	MP91M	SP4019	SP6519	X500	X700
7700VR08	●	●	●	●	●	
7710VRD20				●	●	
7713VR10	●	●	●	●	●	●
7713VR12	●	●		●	●	●



GH1

Uncoated, Micrograin

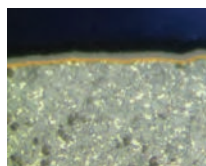
This micrograin grade works well with or without coolant with low cutting pressure at high speeds due to sharp cutting edge.



SP6519

Coating Type: PVD, TiAlN

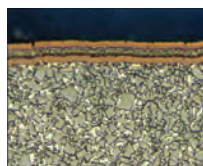
This grade features a combination of a tough substrate with a new generation of TiAlN super nano coating, making it virtually free of residual stress and extremely hard for unmatched performance.



MP91M

Coating Type: CVD, TiN-MT-TiCN-Al₂O₃

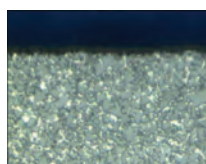
With its aluminum oxide coating, this grade is recommended every time wear characteristics are more important than toughness.



X500

Coating Type: CVD, TiN-TiC-TiN, X-Grade™ Technology

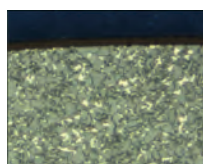
High level of shock resistance; operates at low to medium cutting speeds; high metal removal rates while retaining a secure cutting edge.



SP4019

Coating Type: PVD, TiAlN Micrograin

This hard grade is designed for light roughing and finishing operations with lower chip sections.



X700

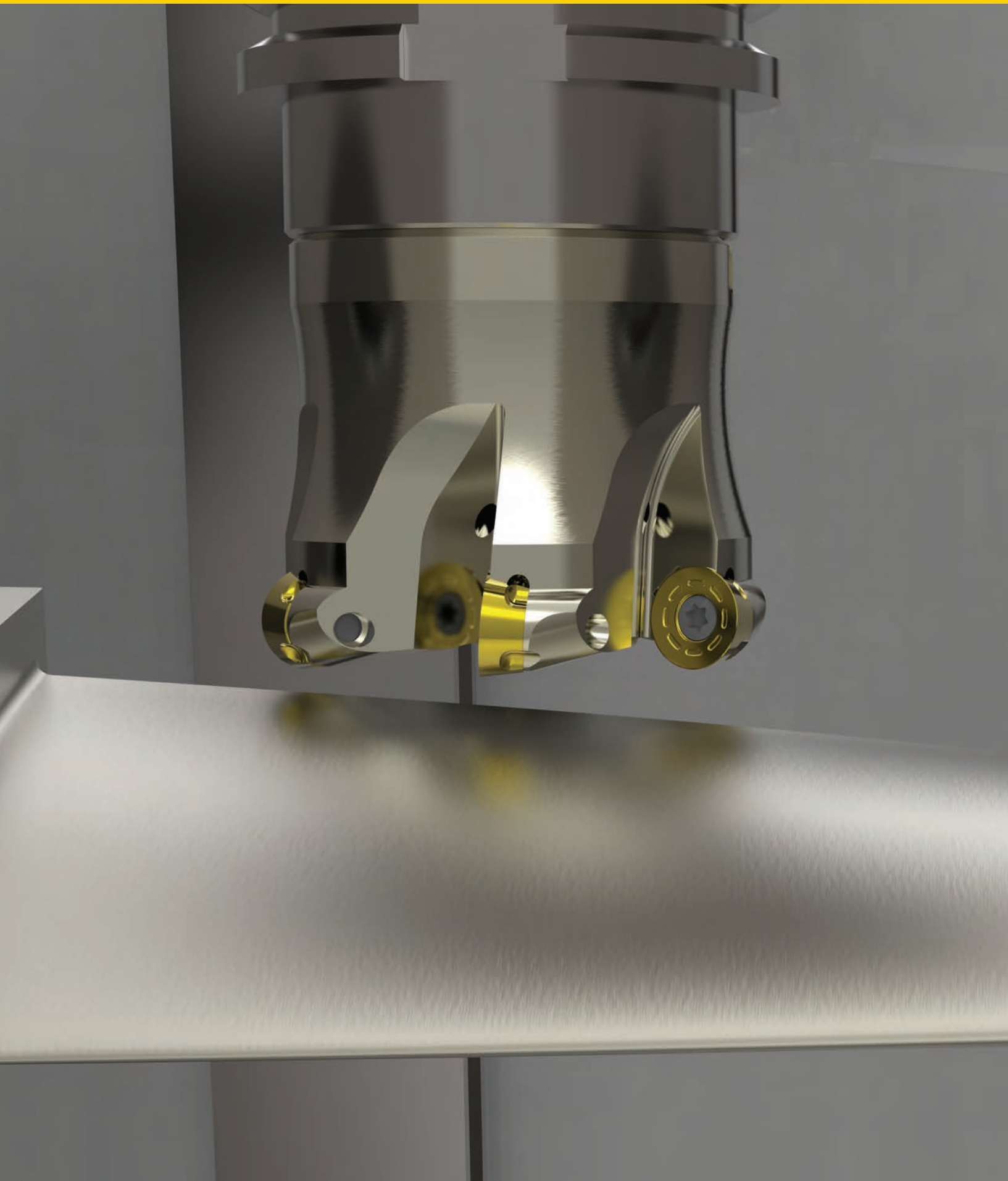
Coating Type: PVD, TiAlN, X-Grade™ Technology

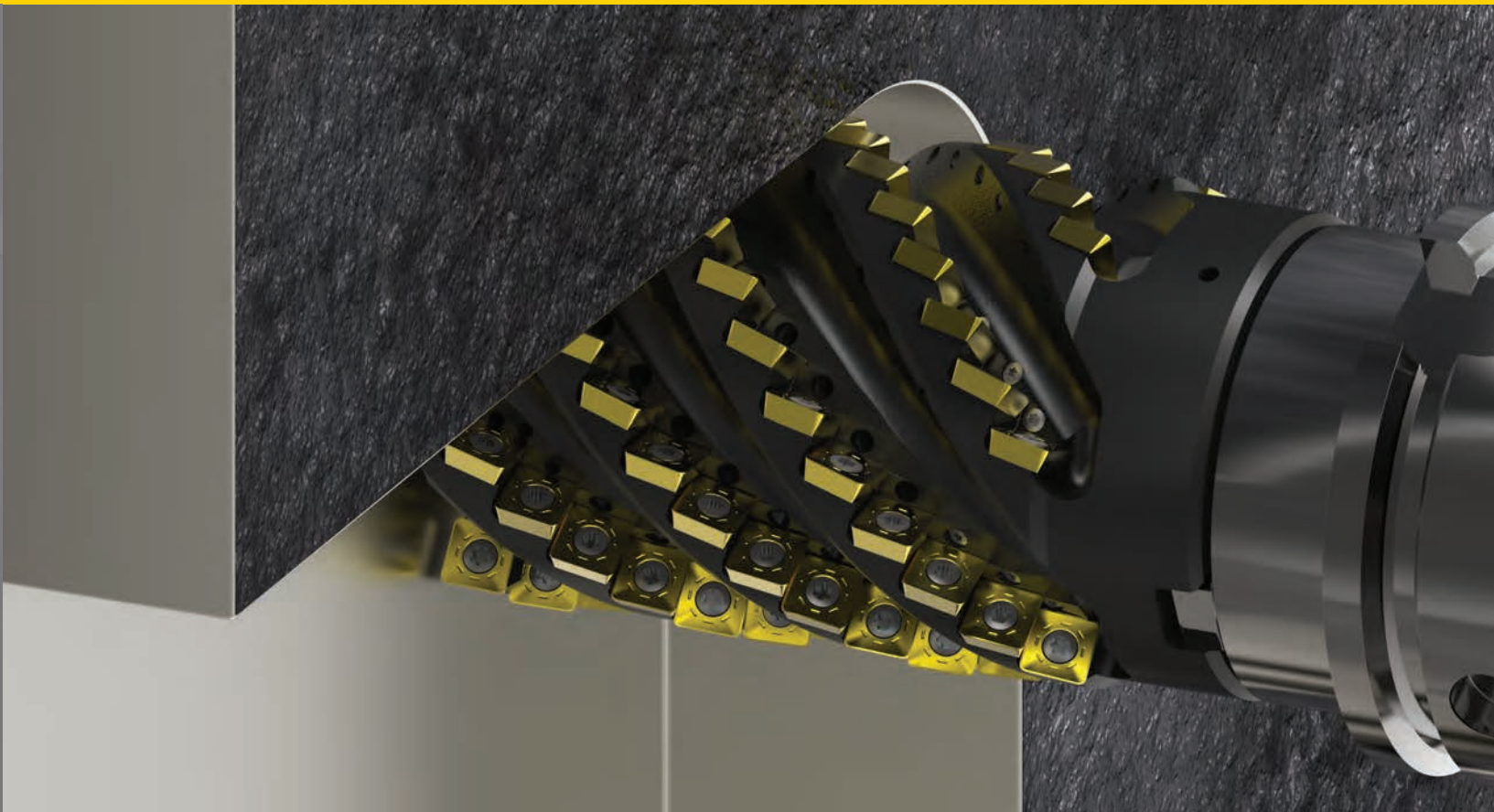
This combination of a highly durable TiAlN PVD coating and specially developed carbide substrate delivers excellent tool life during long contact times of the cutting edge.

Material Guide – Key to Recommended Inserts

Material Designation

Unalloyed Steels
 Alloyed Steels
 Stainless Steels
 PH Stainless
 Cast Irons
 Aluminum & Alloys
 High Temp. Alloys
 Hard Materials





5230 Chevron Long Edge Milling

Setting New Standards of Productivity

- Unique insert alignment reduces cutting forces
- Each insert has its own coolant jet for maximum chip evacuation
- Continuous engagement for maximum material removal



The 5230VS Series: Cut Machining Time by up to 50% or More

Cylindrical
2.0"



Shell
2.0" – 4.0"



- 90 degree roughing
- High Metal Removal Rates
- High Stability and Rigidity
- Square inserts, 4 cutting edges
- Three grades, four geometries
- Shell and Cylindrical construction
- Standard and long series available
- Cutting diameters from 2.0" to 4.0"
- Insert sizes 0.375" and 0.500"
- Depth of cut from 2.010" to 5.236"

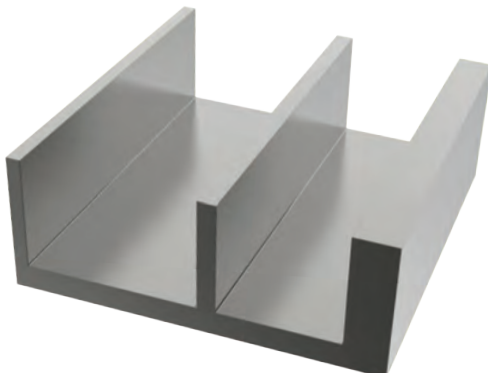
5230 Case Histories

Material: Titanium 555-3
Cutter: 5230VS12 (2.50" Cutter)
Component: Landing Gear
Industry: Aerospace
Insert Grade: X500
RPM: 150
Cutting Speed V_C : 97.4 SFM
Feed per Tooth f_z : 0.004"
Feed Rate: 2.4 IPM
Depth of Cut a_p : 1.969"

Increased Metal Removal Rate by 300%!

Material: Titanium 6-4
Cutter: 5230VS12 (3.0" Cutter)
Component: Bulkhead
Industry: Aerospace
Insert Grade: X500
RPM: 275
Cutting Speed V_C : 226 SFM
Feed per Tooth f_z : 0.004"
Feed Rate: 4.6 IPM
Depth of Cut a_p : 2.362"

Incredible Metal Removal Rate of 43 in³ / min.

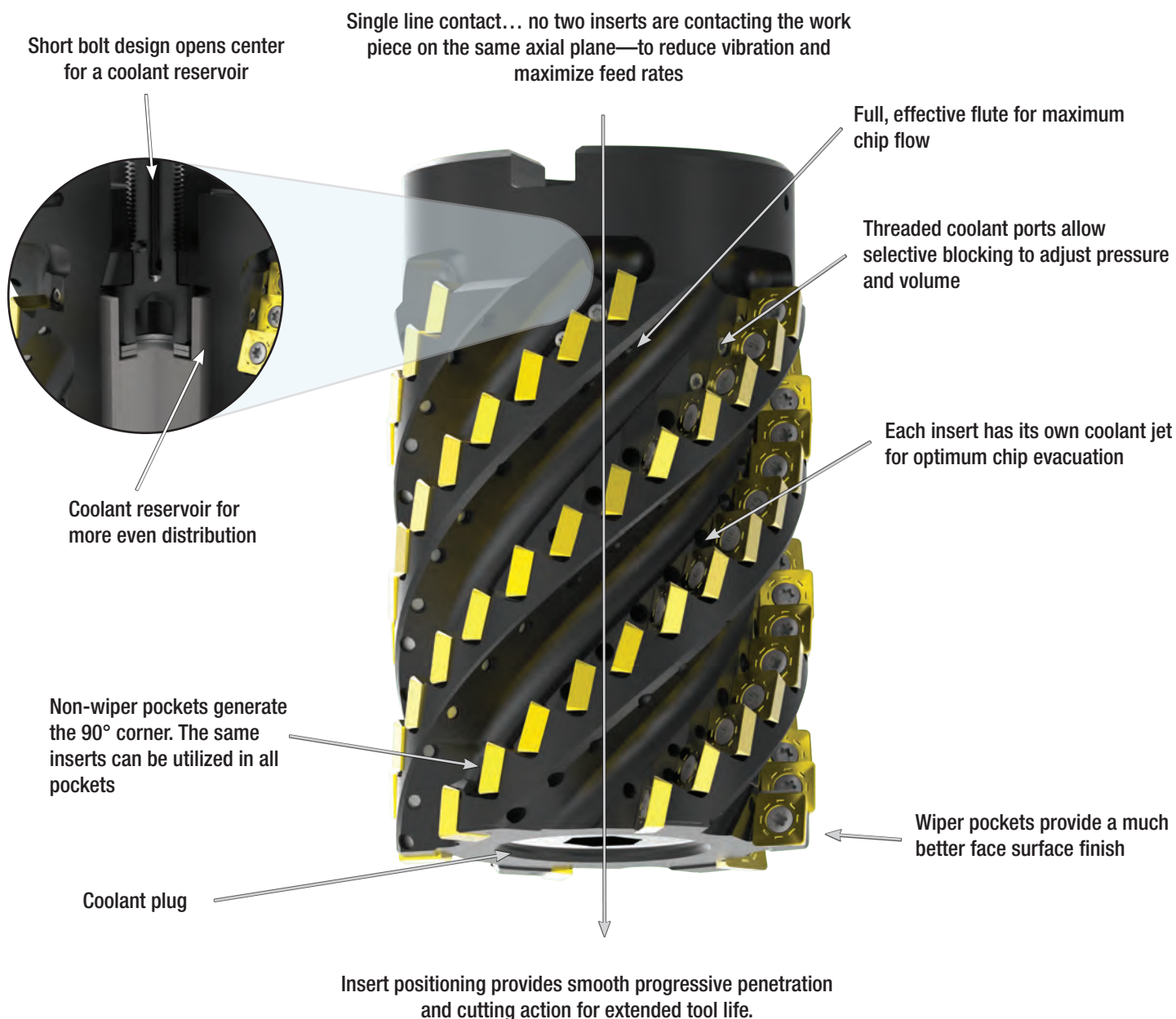


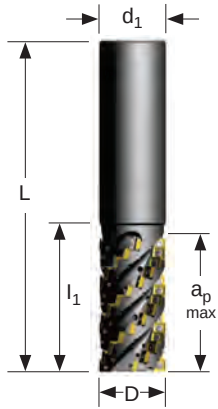


Engineered from the Inside Out

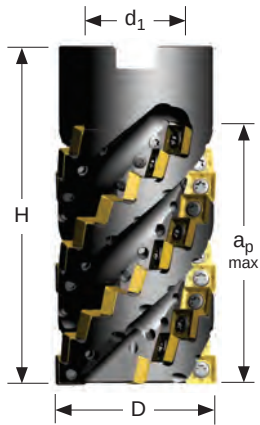
Axial Engagement is the Key

The advanced Chevron Design ensures that one cutting point is always in contact with the material during entrance and exit. This provides optimum harmonic stability, reducing power consumption and maximizing tool life.





Cylindrical Shank



Shell Mill Fixation

Product		Dimensions (inch)								Spares				
EDP	Item Description	D	L/H	l1	d1	ap max	ap max Slotting*	No. of flutes	No. of inserts	EDP		EDP		Screw Tightening in. lbs.
5230VS09 Cylindrical Shank														
033073	C5230VS09-CA2.0Z4R4.0	2.000	10.000	4.500	2.000	4.000	-	4	56	015269	F3508T	015240	T15	18.60
5230VS09 Shell Mill Fixation														
031430	C5230VS09-A2.0Z4R2.0	2.000	2.990	-	1.000	2.010	1.750	4	28	015269	F3508T	015240	T15	18.60
031581	C5230VS09-A2.0Z4R3.1	2.000	4.173	-	1.000	3.150	-	4	44	015269	F3508T	015240	T15	18.60

* Note: Please do not surpass the recommended max. ap for slotting.

Cylindrical Shanks are supplied with insert screws and coolant control screws only.

Shell Mills are supplied with inserts screws, coolant control screws, steel coolant plug, nord-lock washer and mounting screw.

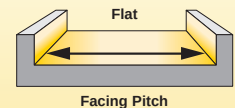
5230VS09 Spare Parts								
Cutter	Coolant control screw			Screwdriver EDP		Steel Coolant Plug		Coolant Plug tightening Ft lbs.
	Screw EDP	Screw	Qty.			EDP	Description	
C5230VS09-CA2.0Z4R4.0	015062	F3006T	6	013214	T9	-	-	-
C5230VS09-A2.0Z4R2.0			8			031436	SB-3413	25
C5230VS09-A2.0Z4R3.1			12			031582	SB-3621	

5230VS09 Torque Values and Spare Parts						
Cutter	Nord Lock Washer		Mounting Bolt (through coolant)		**Torque Values in FT Lbs.	
	EDP	Description	EDP	Description	Normal Condition	Excessive Condition
C5230VS09-CA2.0Z4R4.0	-	-	-	-	-	-
C5230VS09-A2.0Z4R2.0	031258	NLW-0.375	017240	1/2-20 x 1-1/4 SHCSA	59	74
C5230VS09-A2.0Z4R3.1						

** Torque values for mounting bolts. Excessive condition is when long reach extensions are required or when cutting parameters are elevated to extreme parameters.

5230VS09 Technical Information (inch)

Product		Dimensions				
EDP	Item Description	Facing Pitch	Ramping Angle °	Helical Hole min. - max.	ap max Helical / Linear	Max RPM
033073	C5230VS09-CA2.0Z4R4.0	2.000	-	-	-	32,500
031430	C5230VS09-A2.0Z4R2.0	2.000	-	-	-	32,500
031581	C5230VS09-A2.0Z4R3.1	2.000	-	-	-	32,500





SDHT09-422



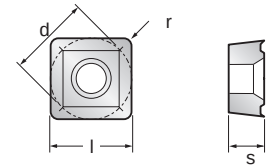
SDHT09-423



SDMT09-41



SDMW09



Product			Application & Material			Dimensions (inch)				
EDP	Item Description	Grade	Roughing ▼	Semi-Finishing ▼▼	Finishing ▼▼▼	d (IC)	l	s	r	h _m min
			Depth of Cut (inch)							
			a _p max* or a _e max.*	a _p max. and a _e max. 15% D**	a _p min. - max.					
031261	SDHT09T308EN-422	X500			-	0.375	0.375	0.156	0.031	0.001
033075	SDHT09T308EN-422	SP6519			-	0.375	0.375	0.156	0.031	0.001
031260	SDHT09T308EN-423	X500		-	-	0.375	0.375	0.156	0.031	0.002
033074	SDHT09T308EN-423	SP6519			-	0.375	0.375	0.156	0.031	0.002
014410	SDMT09T308EN-41	X500			-	0.375	0.375	0.156	0.031	0.002
031479	SDMT09T308EN-41	SP6519			-	0.375	0.375	0.156	0.031	0.002
017325	SDMT09T308EN-41	MP91M			-	0.375	0.375	0.156	0.031	0.002
015232	SDMW09T308TN	X500		-	-	0.375	0.375	0.156	0.031	0.006
031482	SDMW09T308TN	SP6519		-	-	0.375	0.375	0.156	0.031	0.006
017327	SDMW09T308TN	MP91M		-	-	0.375	0.375	0.156	0.031	0.006

Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 63.

* Note: Please do not surpass the recommended max. a_p for slotting as shown on the steel body page 52.

* Note: a_p max. for profiling is only possible when a_e < 75% of the Diameter.

** Note: For semi finishing, axial engagement a_p for slotting and radial engagement a_e for profiling should be max. 15% of the Diameter.
Inserts SDHT09T308EN-423 to be used in unstable conditions.

Note: Feed recommendations can be found on page 54. Speed recommendations can be found on page 55.



5230VS09 Feeds f_z (inch/flute)

Geometry	Grade	Operation	Unalloyed Steel	Alloyed Steel	Stainless Steel	Stainless Steel Refractory PH	Gray Iron	Spheroidal-Ductile Iron	Malleable Iron	Aluminum & Alloys <16% Si 116 HBN	Aluminum & Silicon >16% Si 92 HBN	HTA Iron Based Alloys	HTA Cobalt Based Alloys	HTA Nickel Based Alloys	HTA Titanium Based Alloys	Hard Steel >1400 N/mm ² >415 HBN	Chilled Cast Iron >1400 N/mm ² >400 HBN
			Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.
EN-422	X500	Shoulder/Profiling	-	-	0.002 - 0.005	0.002 - 0.005	-	-	-	-	-	0.002 - 0.004	0.002 - 0.004	0.002 - 0.005	0.002 - 0.006	-	-
		Slotting	-	-	0.002 - 0.004	0.002 - 0.004	-	-	-	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.004	0.002 - 0.005	-	-
EN-422	SP6519	Shoulder/Profiling	-	-	0.002 - 0.005	0.002 - 0.004	-	-	-	-	-	0.002 - 0.004	0.002 - 0.004	0.002 - 0.005	0.002 - 0.006	-	-
		Slotting	-	-	0.002 - 0.004	0.002 - 0.004	-	-	-	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.004	0.002 - 0.005	-	-
EN-423	X500	Shoulder/Profiling	-	-	-	0.002 - 0.005	-	-	-	-	-	0.002 - 0.004	0.002 - 0.004	0.002 - 0.005	0.002 - 0.006	-	-
		Slotting	-	-	-	0.002 - 0.004	-	-	-	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.004	0.002 - 0.005	-	-
EN-423	SP6519	Shoulder/Profiling	-	-	0.002 - 0.005	0.002 - 0.004	-	-	-	-	-	0.002 - 0.004	0.002 - 0.004	0.002 - 0.005	0.002 - 0.006	-	-
		Slotting	-	-	0.002 - 0.004	0.002 - 0.004	-	-	-	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.004	0.002 - 0.005	-	-
EN-41	X500	Shoulder/Profiling	0.002 - 0.006	0.002 - 0.006	0.002 - 0.005	-	0.002 - 0.006	0.002 - 0.006	0.002 - 0.005	-	-	-	-	-	-	-	-
		Slotting	0.002 - 0.005	0.002 - 0.005	0.002 - 0.004	-	0.002 - 0.005	0.002 - 0.005	0.002 - 0.004	-	-	-	-	-	-	-	-
EN-41	SP6519	Shoulder/Profiling	0.002 - 0.006	0.002 - 0.006	-	-	0.002 - 0.006	0.002 - 0.006	0.002 - 0.005	-	-	-	-	-	-	-	-
		Slotting	0.002 - 0.005	0.002 - 0.005	-	-	0.002 - 0.005	0.002 - 0.005	0.002 - 0.004	-	-	-	-	-	-	-	-
EN-41	MP91M	Shoulder/Profiling	0.002 - 0.005	0.002 - 0.005	-	-	0.002 - 0.006	0.002 - 0.006	0.002 - 0.005	-	-	-	-	-	-	-	-
		Slotting	0.002 - 0.004	0.002 - 0.004	-	-	0.002 - 0.005	0.002 - 0.005	0.002 - 0.004	-	-	-	-	-	-	-	-
TN	X500	Shoulder/Profiling	0.006 - 0.008	0.005 - 0.007	-	-	-	-	-	-	-	-	-	-	-	-	-
		Slotting	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TN	SP6519	Shoulder/Profiling	0.006 - 0.008	0.005 - 0.007	-	-	-	-	-	-	-	-	-	-	-	-	-
		Slotting	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TN	MP91M	Shoulder/Profiling	-	-	-	-	0.006 - 0.007	0.006 - 0.007	0.006 - 0.007	-	-	-	-	-	-	-	-
		Slotting	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

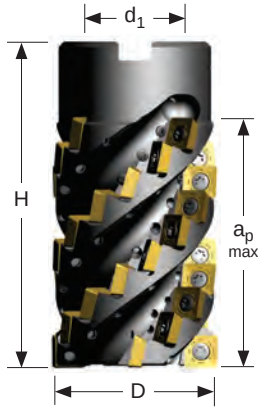
Note: HTA = High Temperature Alloys

Note: Above feed rates are calculated on centerline.

Speed recommendations can be found on page 55.



Speed v_c (SFM)															
5230VS Series				Wear Resistance											
				-  +											
				Speed min. - max.											
Coolant Recommendation				 		CVD X Grade		 		PVD Standard		 		CVD Standard	
Recommended ● Possible ◎															
ISO	Materials	Rm and Hardness			X500				SP6519				MP91M		
P	Unalloyed Steel	<600 N/mm ² <180 HBN	◎	●	425 - 885		◎	●	425 - 970		●	460 - 1130			
		375 - 785			375 - 855				395 - 1000						
	Alloyed Steel	700-950 N/mm ² 200-280 HBN	◎	●	330 - 690		◎	●	330 - 755		●	345 - 885			
		950-1200 N/mm ² 280-355 HBN			245 - 525				245 - 575			260 - 675			
		1200-1400 N/mm ² 355-415 HBN			165 - 330				165 - 360			165 - 425			
M	Stainless Steel	Austenitic + Ferritic 300 series	◎	●	375 - 820		◎	●	375 - 885						
		Martensitic 400 series			330 - 720				345 - 770						
	PH Stainless	Refractory P.H.	●		165 - 360		●		165 - 395						
K	Cast Iron	Grey GG-Ft	◎	●	395 - 920		◎	●	460 - 970		●	475 - 1200			
		Spheroidal-Ductile GGG-FGS			345 - 675				360 - 785			375 - 935			
		Malleable GTS - MN/MP			310 - 560				330 - 720			345 - 855			
N	Aluminum & Alloys	Aluminum & Alloys < 16% Si 116 HBN													
		Aluminum + Silicon > 16% Si 92 HBN													
S	High Temperature Alloys	Iron Based	●		75 - 160		●		75 - 180						
		70 - 145			70 - 160										
		80 - 170			80 - 180										
		115 - 240			120 - 260										
H	Hard Materials	Hard Steel >1400 N/mm ² >415 HBN													
		Chilled Cast Iron >1400 N/mm ² > 400 HBN													



Shell Mill Fixation

Product		Dimensions (inch)								Spares				
EDP	Item Description	D	L/H	l ₁	d ₁	ap max	ap max Slotting*	No. of flutes	No. of inserts	EDP		EDP		Screw Tightening in. lbs.
5230VS12 Shell Mill Fixation														
031234	C5230VS12-A2.5Z4R2.24	2.500	3.346	-	1.000	2.244	2.000	4	24	015270	F4011T	015241	T20	27.40
031133	C5230VS12-A2.5Z4R3.70	2.500	4.881	-	1.000	3.700	-	4	40	015270	F4011T	015241	T20	27.40
031606	C5230VS12-A3.0Z5R2.56	3.000	3.740	-	1.250	2.560	2.360	5	35	015270	F4011T	015241	T20	27.40
031607	C5230VS12-A3.0Z5R4.33	3.000	5.629	-	1.250	4.433	-	5	60	015270	F4011T	015241	T20	27.40
031236	C5230VS12-A4.0Z6R3.00	4.000	3.937	-	1.500	3.000	2.760	6	48	015270	F4011T	015241	T20	27.40
031237	C5230VS12-A4.0Z6R5.23	4.000	6.496	-	1.500	5.236	-	6	84	015270	F4011T	015241	T20	27.40

* Note: Please do not surpass the recommended max. ap for slotting.

Shell Mills are supplied with inserts screws, coolant control screws, steel coolant plug, nord-lock washer and mounting screw.

5230VS12 Spare Parts

Cutter	Coolant control screw			Screwdriver EDP		Steel Coolant Plug		Coolant Plug tightening Ft lbs.
	Screw EDP	Screw	Qty.			EDP	Description	
C5230VS12-A2.5Z4R2.24	015062	F3006T	8	013214	T9	031262	SB-3229	25
C5230VS12-A2.5Z4R3.70			12			031263	SB-3230	
C5230VS12-A3.0Z5R2.56			10			031264	SB-3231	
C5230VS12-A3.0Z5R4.33			15			031265	SB-3232	45
C5230VS12-A4.0Z6R3.00			12			031266	SB-3233	
C5230VS12-A4.0Z6R5.23			18			031267	SB-3234	

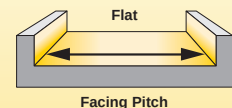
5230VS12 Torque Values and Spare Parts

Cutter	Nord Lock Washer		Mounting Bolt (through coolant)		**Torque Values in FT Lbs.	
	EDP	Description	EDP	Description	Normal Condition	Excessive Condition
C5230VS12-A2.5Z4R2.24	031258	NLW-0.375	017420	1/2-20 x 1-1/4 SHCSA	59	74
C5230VS12-A2.5Z4R3.70						
C5230VS12-A3.0Z5R2.56						
C5230VS12-A3.0Z5R4.33	031226	NLW-12SP	017424	5/8-18 x 1-1/2 SHCSA	81.1	110.6
C5230VS12-A4.0Z6R3.00	031259	NLW-16SP	017422	3/4-16 x 1-3/4 SHCSA	88.5	132.76
C5230VS12-A4.0Z6R5.23						

** Torque values for mounting bolts. Excessive condition is when long reach extensions are required or when cutting parameters are elevated to extreme parameters.

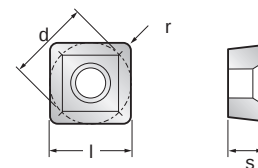
5230VS12 Technical Information (inch)

Product		Dimensions				
EDP	Item Description	Facing Pitch	Ramping Angle °	Helical Hole min. - max.		ap max Helical / Linear
031234	C5230VS12-A2.5Z4R2.24	2.500	-	-	-	21,000
031133	C5230VS12-A2.5Z4R3.70	2.500	-	-	-	21,000
031606	C5230VS12-A3.0Z5R2.56	3.000	-	-	-	18,500
031607	C5230VS12-A3.0Z5R4.33	3.000	-	-	-	18,500
031236	C5230VS12-A4.0Z6R3.00	4.000	-	-	-	16,000
031237	C5230VS12-A4.0Z6R5.23	4.000	-	-	-	16,000





SDHT12-422 SDHT12-423 SDMT12-41 SDMW12-TN



Product			Application & Material			Dimensions (inch)				
EDP	Item Description	Grade	Roughing ▼	Semi-Finishing ▼▼	Finishing ▼▼▼	d (IC)	l	s	r	h _m min
			Depth of Cut (inch)							
			a _p max* or a _e max.*	a _p max. and a _e max. 15% D**	a _p min. - max.					
030717	SDHT120412EN-422	X500	◆◆	●●●	-	0.500	0.500	0.187	0.047	0.002
030728	SDHT120412EN-422	SP6519	◆●	◆◆◆	-	0.500	0.500	0.187	0.047	0.002
031218	SDHT120412EN-423	X500	■	-	-	0.500	0.500	0.187	0.047	0.002
031321	SDHT120412EN-423	SP6519	■●	■	-	0.500	0.500	0.187	0.047	0.002
014411	SDMT120412EN-41	X500	●	■	-	0.500	0.500	0.187	0.047	0.002
031480	SDMT120412EN-41	SP6519	■	◆	-	0.500	0.500	0.187	0.047	0.002
017326	SDMT120412EN-41	MP91M	■	●	-	0.500	0.500	0.187	0.047	0.002
015233	SDMW120412TN	X500	●●	-	-	0.500	0.500	0.187	0.047	0.006
034518	SDMW120412TN	SP6519	◆◆	-	-	0.500	0.500	0.187	0.047	0.006
017328	SDMW120412TN	MP91M	◆	-	-	0.500	0.500	0.187	0.047	0.006



Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 63.

* Note: Please do not surpass the recommended max. a_p for slotting as shown on the steel body page 56.

* Note: a_p max. for profiling is only possible when a_e < 75% of the Diameter.

** Note: For semi finishing, axial engagement a_p for slotting and radial engagement a_e for profiling should be max. 15% of the Diameter.
Inserts SDHT120412EN-423 to be used in unstable conditions.

Note: Feed recommendations can be found on page 58. Speed recommendations can be found on page 59.



5230VS12 Feeds f_z (inch/flute)

Geometry	Grade	Operation	Unalloyed Steel	Alloyed Steel	Stainless Steel	Stainless Steel Refractory PH	Gray Iron	Spheroidal-Ductile Iron	Malleable Iron	Aluminum & Alloys <16% Si 118 HBN	Aluminum & Silicon >16% Si 92 HBN	HTA Iron Based Alloys	HTA Cobalt Based Alloys	HTA Nickel Based Alloys	HTA Titanium Based Alloys	Hard Steel >1400 N/mm ² >415 HBN	Chilled Cast Iron >1400 N/mm ² >400 HBN
			Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.
EN-422	X500	Shoulder/Profiling	-	-	0.002 - 0.006	0.002 - 0.006	-	-	-	-	-	0.002 - 0.005	0.002 - 0.005	0.002 - 0.005	0.002 - 0.005	-	-
		Slotting	-	-	0.002 - 0.005	0.002 - 0.005	-	-	-	-	-	0.002 - 0.004	0.002 - 0.004	0.002 - 0.004	0.002 - 0.004	-	-
EN-422	SP6519	Shoulder/Profiling	-	-	0.002 - 0.006	0.002 - 0.006	-	-	-	-	-	0.002 - 0.005	0.002 - 0.005	0.002 - 0.005	0.002 - 0.005	-	-
		Slotting	-	-	0.002 - 0.005	0.002 - 0.005	-	-	-	-	-	0.002 - 0.004	0.002 - 0.004	0.002 - 0.004	0.002 - 0.004	-	-
EN-423	X500	Shoulder/Profiling	-	-	-	0.002 - 0.006	-	-	-	-	-	0.002 - 0.005	0.002 - 0.005	0.002 - 0.005	0.002 - 0.006	-	-
		Slotting	-	-	-	0.002 - 0.005	-	-	-	-	-	0.002 - 0.004	0.002 - 0.004	0.002 - 0.004	0.002 - 0.005	-	-
EN-423	SP6519	Shoulder/Profiling	-	-	0.002 - 0.006	0.002 - 0.006	-	-	-	-	-	0.002 - 0.005	0.002 - 0.005	0.002 - 0.005	0.002 - 0.006	-	-
		Slotting	-	-	0.002 - 0.005	0.002 - 0.005	-	-	-	-	-	0.002 - 0.004	0.002 - 0.004	0.002 - 0.004	0.002 - 0.005	-	-
EN-41	X500	Shoulder/Profiling	0.002 - 0.007	0.002 - 0.007	0.002 - 0.006	-	0.002 - 0.007	0.002 - 0.007	0.002 - 0.006	-	-	-	-	-	-	-	-
		Slotting	0.002 - 0.006	0.002 - 0.006	0.002 - 0.005	-	0.002 - 0.006	0.002 - 0.006	0.002 - 0.005	-	-	-	-	-	-	-	-
EN-41	SP6519	Shoulder/Profiling	0.002 - 0.007	0.002 - 0.007	-	-	0.002 - 0.007	0.002 - 0.007	0.002 - 0.006	-	-	-	-	-	-	-	-
		Slotting	0.002 - 0.006	0.002 - 0.006	-	-	0.002 - 0.006	0.002 - 0.006	0.002 - 0.005	-	-	-	-	-	-	-	-
EN-41	MP91M	Shoulder/Profiling	0.002 - 0.007	0.002 - 0.007	-	-	0.002 - 0.007	0.002 - 0.007	0.002 - 0.006	-	-	-	-	-	-	-	-
		Slotting	0.002 - 0.006	0.002 - 0.006	-	-	0.002 - 0.006	0.002 - 0.006	0.002 - 0.005	-	-	-	-	-	-	-	-
TN	X500	Shoulder/Profiling	0.006 - 0.008	0.005 - 0.007	-	-	-	-	-	-	-	-	-	-	-	-	-
		Slotting	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TN	SP6519	Shoulder/Profiling	0.006 - 0.008	0.005 - 0.007	-	-	-	-	-	-	-	-	-	-	-	-	-
		Slotting	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TN	MP91M	Shoulder/Profiling	-	-	-	-	0.005 - 0.008	0.005 - 0.008	0.005 - 0.007	-	-	-	-	-	-	-	-
		Slotting	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: HTA = High Temperature Alloys

Note: Above feed rates are calculated on centerline.

Speed recommendations can be found on page 59.



Speed v_c (SFM)															
5230VS Series				Wear Resistance											
				-  +											
				Speed min. - max.											
Coolant Recommendation						CVD X Grade				PVD Standard				CVD Standard	
Recommended ● Possible ◎															
ISO	Materials	Rm and Hardness			X500			SP6519			MP91M				
P	Unalloyed Steel	<600 N/mm ² <180 HBN	◎	●	425 - 885	◎	●	425 - 970			460 - 1130				
		<950 N/mm ² <280 HBN			375 - 785			375 - 855			395 - 1000				
	Alloyed Steel	700-950 N/mm ² 200-280 HBN	◎	●	330 - 690	◎	●	330 - 755			345 - 885				
		950-1200 N/mm ² 280-355 HBN			245 - 525			245 - 575			260 - 675				
		1200-1400 N/mm ² 355-415 HBN		●	165 - 330		●	165 - 360		●	165 - 425				
M	Stainless Steel	Austenitic + Ferritic 300 series	◎	●	375 - 820	◎	●	375 - 885							
		Martensitic 400 series			330 - 720			345 - 770							
	PH Stainless	Refractory P.H.	●		165 - 360	●		165 - 395							
K	Cast Iron	Grey GG-Ft			395 - 920			460 - 970			475 - 1200				
		Spheroidal-Ductile GGG-FGS	◎	●	345 - 675	◎	●	360 - 785		●	375 - 935				
		Malleable GTS - MN/MP			310 - 560			330 - 720			345 - 855				
N	Aluminum & Alloys	Aluminum & Alloys < 16% Si 116 HBN													
		Aluminum + Silicon > 16% Si 92 HBN													
S	High Temperature Alloys	Iron Based			75 - 160			75 - 180							
		Cobalt Based			70 - 145			70 - 160							
		Nickel Based	●		80 - 170	●		80 - 180							
		Titanium Based			115 - 240			120 - 260							
H	Hard Materials	Hard Steel >1400 N/mm ² >415 HBN													
		Chilled Cast Iron >1400 N/mm ² > 400 HBN													



Calculation of the average chip thickness in relation with the a_e (Radial Engagement) if a_e is less than 50% of dia.

Formula: Program Feed Rate (f_z)

$$f_z = h_m \times \sqrt{\frac{d}{a_e}}$$

h_m = Average chip thickness

a_e = Radial engagement

f_z = Feed per tooth

d = Cutter diameter

Formula: Average Chip Thickness (h_m)

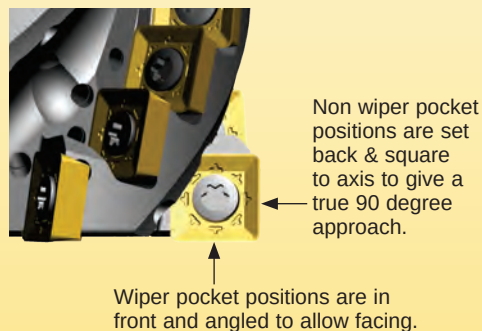
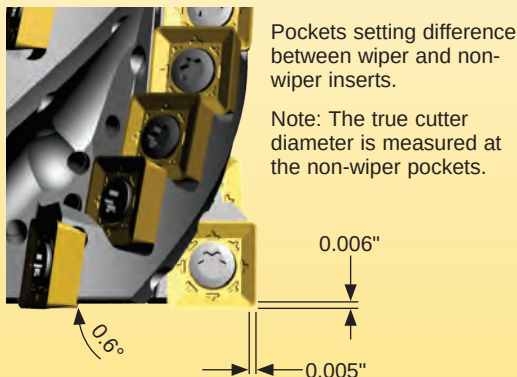
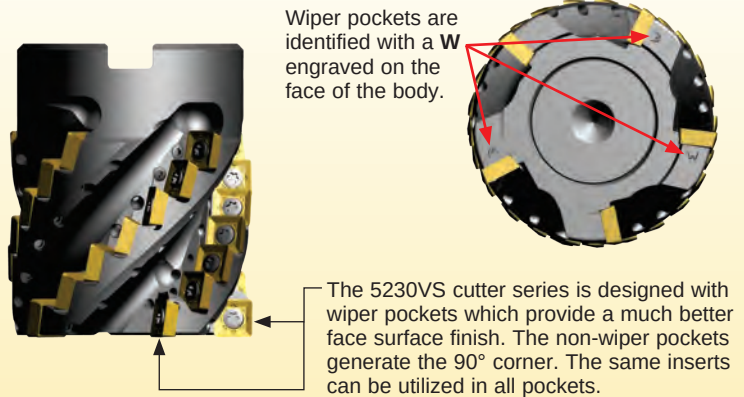
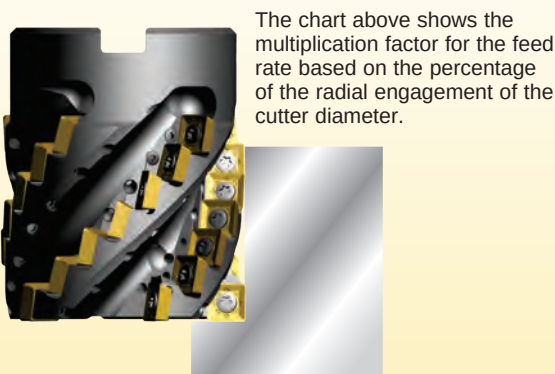
$$h_m = f_z \times \sqrt{\frac{a_e}{d}}$$

h_m Correction Coefficient Chart

Cutter Ø 2.000"			Cutter Ø 2.500"			Cutter Ø 3.000"			Cutter Ø 4.000"		
$a_e\%$	a_e (Inch)	Coefficient Factor	$a_e\%$	a_e (Inch)	Coefficient Factor	$a_e\%$	a_e (Inch)	Coefficient Factor	$a_e\%$	a_e (Inch)	Coefficient Factor
5	0.100	2.294	5	0.125	2.329	5	0.150	2.294	5	0.200	2.294
10	0.200	1.667	10	0.250	1.667	10	0.300	1.667	10	0.400	1.667
15	0.300	1.400	15	0.375	1.425	15	0.450	1.407	15	0.600	1.407
20	0.400	1.250	20	0.500	1.250	20	0.600	1.250	20	0.800	1.250
25	0.500	1.155	25	0.625	1.160	25	0.750	1.155	25	1.000	1.155
35	0.700	1.048	35	0.875	1.056	35	1.050	1.048	35	1.400	1.056
50 - 100	1.000 - 2.000	1.000	50 - 100	1.250 - 2.500	1.000	50 - 100	1.500 - 3.000	1.000	50 - 100	2.000 - 4.000	1.000

Example: A 3.000" diameter cutter using a 0.300" radial engagement (a_e) = 10% of the cutter diameter.

At 10%, your coefficient is 1.667 (see above table); therefore you must multiply your feed rate by 1.667 for correcting the feed for profiling.



Cutter Diameter (inch)	No. of Wiper Inserts
2.000	2
2.500	2
3.000	3
4.000	3



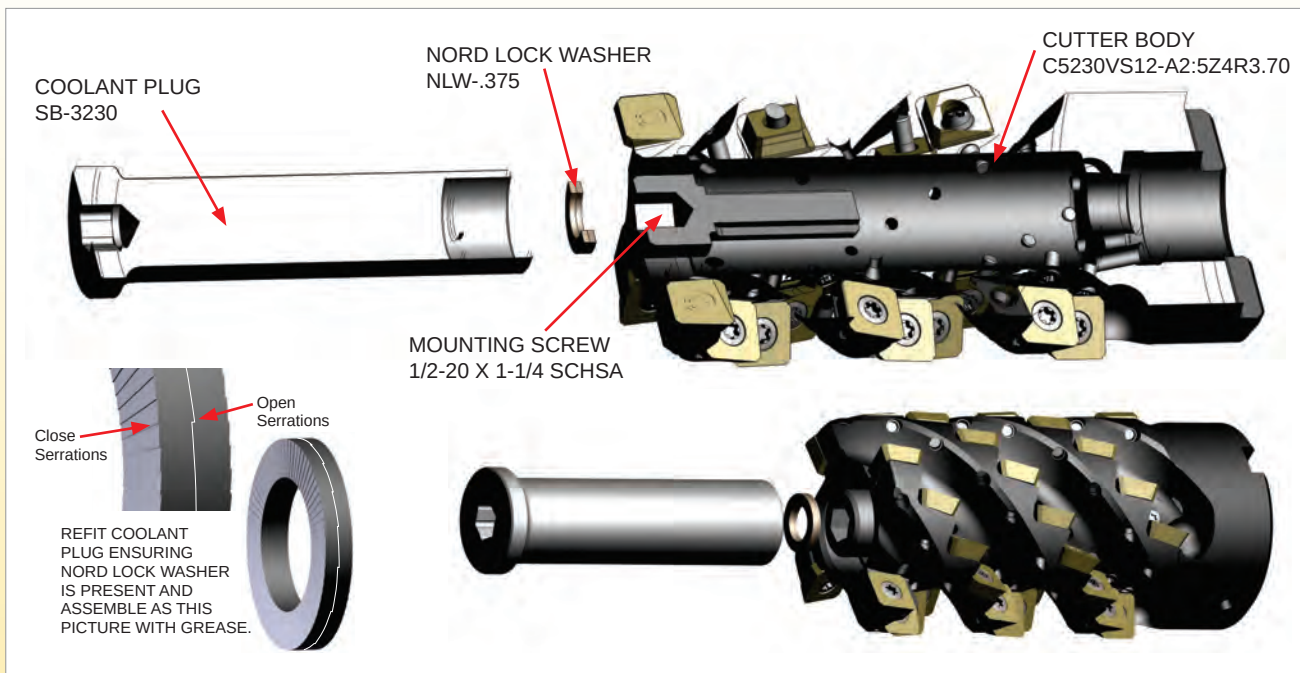
5230VS09 and VS12 Fitting Instructions for Shell Mill Cutters

NOTE: All Shell Mill 5230VS09 and VS12 Chevron Porcupine Cutters are supplied assembled with mounting bolt, nord lock washer and steel coolant plug.

Please follow the instructions below to disassemble the cutter, attach the cutter to a shell mill adapter and reassemble coolant plug. It is very important to use the proper torque when reassembling the cutter with the mounting bolt, nord lock washer and coolant plug.



Example of cutter: C5230VS12-A2.5Z4R3.70 assembly



1. Remove coolant plug. (Note: Ensure the nord lock washer is retained to the bottom of the coolant plug.)
2. Fit the cutter body to the shell mill adapter and secure using the mounting bolt supplied with the cutter.
Note: The mounting bolt must be properly torqued to the specified torque setting shown in the chart (page 62) in Detail 1.
3. Refit coolant plug ensuring nord lock washer is present and in the proper location on the bottom of the coolant plug.
A small amount of grease can be used to hold the nord lock washer in place.
4. Tighten coolant plug with specified torque setting shown in the chart (page 62) in Detail 2.
5. Note: If axial depth of cut (a_p) is less than maximum a_p of the cutter, then F3006T coolant control screws supplied separately can be used to block coolant holes forcing more coolant to the front of the cutter. If these screws are used, please secure with loctite or similar product.



Torque values for mounting bolts

Excessive condition is when long reach extensions are required or when cutting parameters are elevated to extreme parameters.

5230VS09	Detail 1			Detail 2	
Cutter	Mounting Bolt Description	**Torque Values in FT Lbs. for Mounting Bolt		Coolant Plug Description	Coolant Plug tightening Ft lbs.
		Normal Condition	Excessive Condition		
C5230VS09-A2.0Z4R2.0	1/2-20 x 1-1/4 SHCSA	59	74	SB-3413	25
C5230VS09-A2.0Z4R3.1				SB-3621	

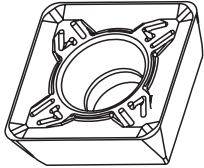
5230VS12	Detail 1			Detail 2	
Cutter	Mounting Bolt Description	**Torque Values in FT Lbs. for Mounting Bolt		Coolant Plug Description	Coolant Plug tightening Ft lbs.
		Normal Condition	Excessive Condition		
C5230VS12-A2.5Z4R2.24	1/2-20 x 1-1/4 SHCSA	59	74	SB-3229	25
C5230VS12-A2.5Z4R3.70				SB-3230	
C5230VS12-A3.0Z5R2.56	5/8-18 x 1-1/2 SHCSA	81.1	110.6	SB-3231	45
C5230VS12-A3.0Z5R4.33				SB-3232	
C5230VS12-A4.0Z6R3.00	3/4-16 x 1-3/4 SHCSA	88.5	132.76	SB-3233	45
C5230VS12-A4.0Z6R5.23				SB-3234	

Mounting Bolt Hex Keys

M12 = Hex Key Size 10
M16 = Hex Key Size 14
M20 = Hex Key Size 17

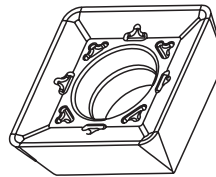


5230 Geometries



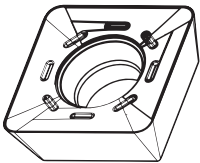
-41

This general purpose utility geometry has a positive cutting action and reinforced cutting edge for medium roughing and semi-finishing applications.



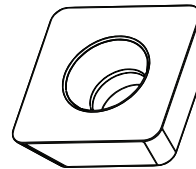
-423

A strong positive geometry featuring a smaller primary angle and a small controlled hone to reduce cutting pressures, followed by a higher secondary angle to allow free cutting of the chip without rubbing on the insert rake face. Chip flow compresses the chip for easy evacuation.



-422

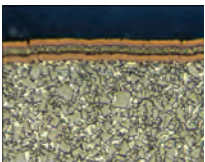
This positive geometry features an 11° chip angle and an “E” edge preparation for roughing and semi-finishing applications in difficult to machine materials.



-TN

This geometry is a flat top design with a strong T-land edge preparation for preventing chipping in unstable conditions. It has a smaller edge preparation which reduces machine power consumption.

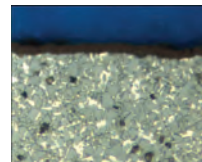
5230 Grades



X500

Coating Type: CVD, TiN-TiC-TiN, X-Grade™ Technology

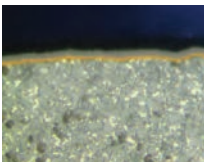
High level of shock resistance; operates at the low to medium cutting speeds; high metal removal rates while retaining a secure cutting edge.



SP6519

Coating Type: PVD, TiAlN

This grade features a combination of a tough substrate with a new generation of TiAlN super nano coating, making it virtually free of residual stress and extremely hard for unmatched performance.



MP91M

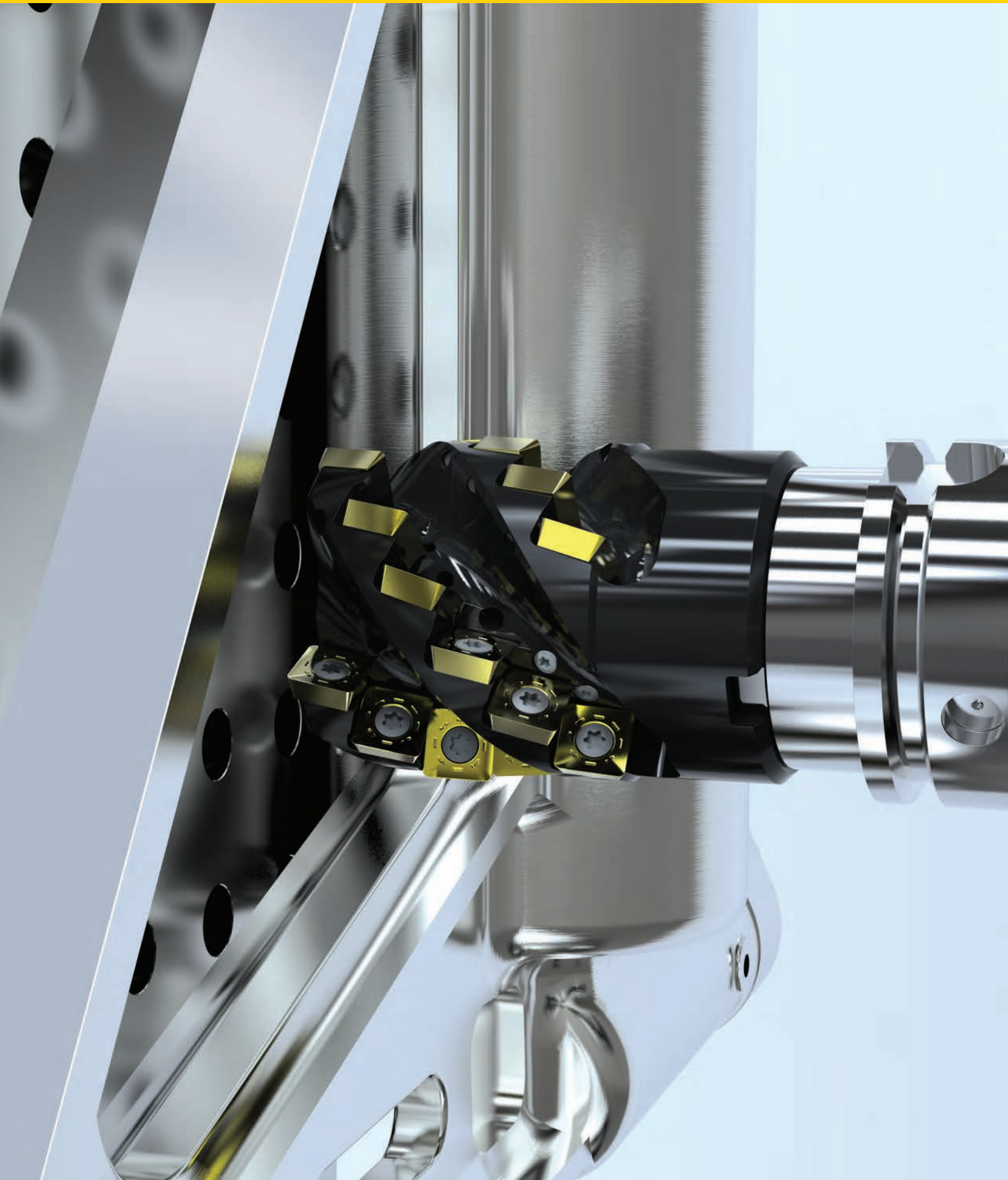
Coating Type: CVD, TiN-MT-TiCN-Al2O3

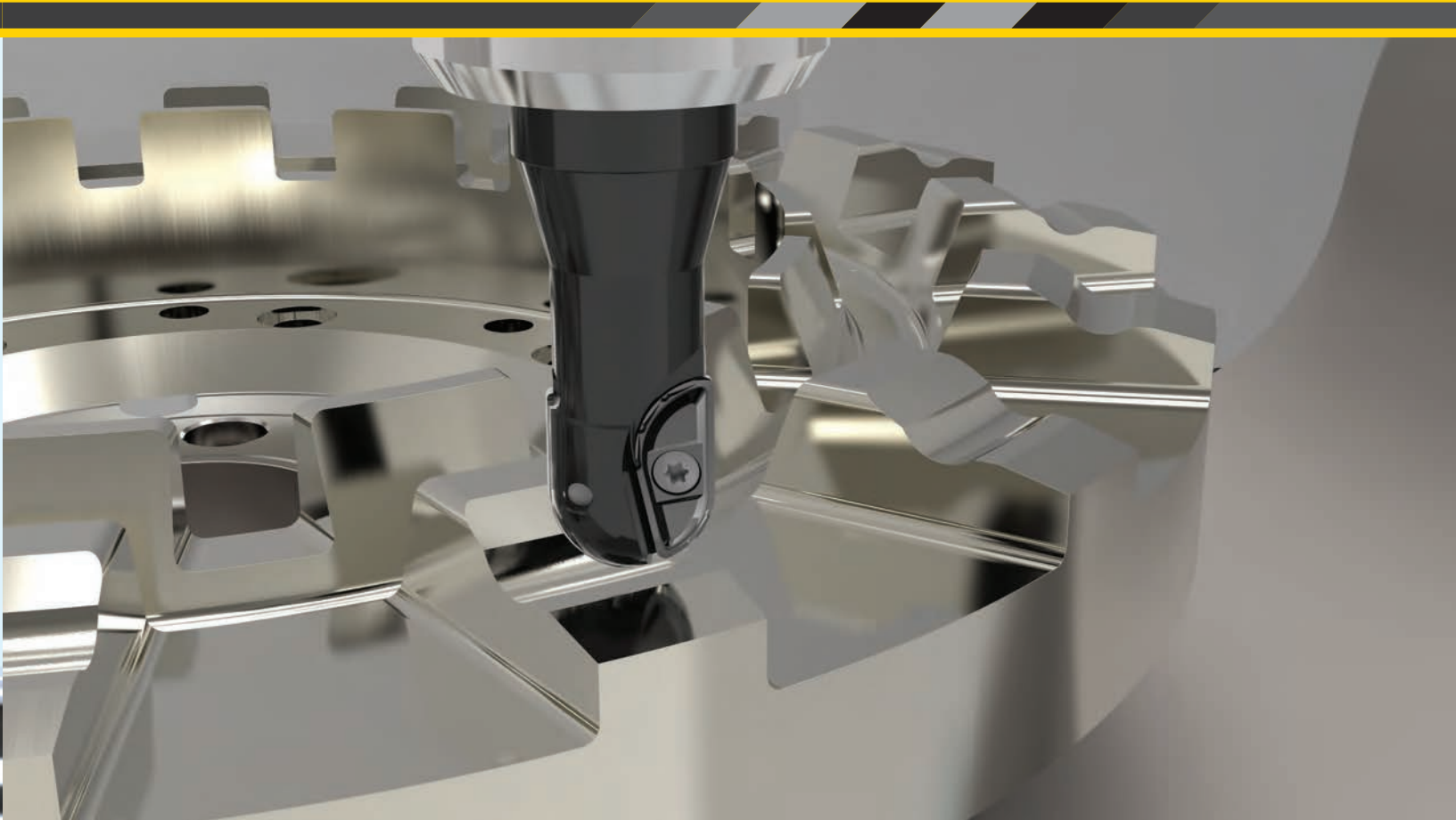
With its Aluminum Oxide coating, this grade is recommended every time wear characteristics are more important than toughness.

Material Guide – Key to Recommended Inserts

Material Designation

Unalloyed Steels Alloyed Steels Stainless Steels PH Stainless Cast Irons Aluminum & Alloys High Temp. Alloys Hard Materials





5505 Ball Nose Contour Milling

**Contour Milling of Mild Steels to
High Temperature Superalloys**



5505VX State of the Art Ball Nose Cutters

Weldon

0.750" – 2.0"



- Reinforced design for heavy machining
- High volume of chip cutting
- Excellent chip control and evacuation

Cylindrical

0.625" – 1.250"



5505VX Ball Nose Cutters are ideal for roughing and semi-finishing of profiles and complex contours in Steel, Alloyed Steel, Stainless Steel, High Temperature Alloys and Cast Iron.

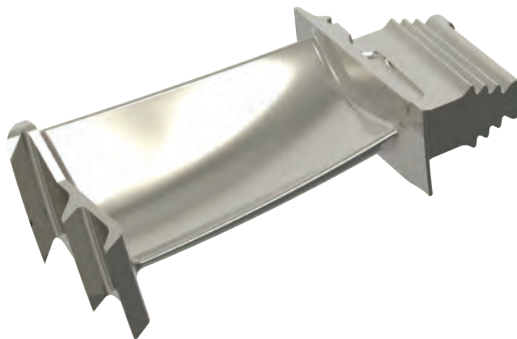
- One grade, one geometry does it all
- Helical insert design and rigid fixation for increased speeds and feeds
- Double edge insert is indexable for reduced inventory
- Slotting to full radius

Modular

0.625" – 1.250"



Case History



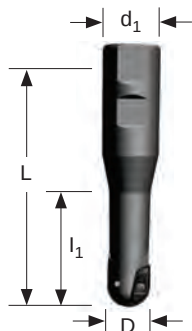
Material: Stainless Steel 403
 Cutter: 5505VX (1.0" Cutter)
 Component: Turbine Blade
 Industry: Power Generation
 Insert Grade: SP6519
 RPM: 2,293
 Cutting Speed V_C : 600 SFM
 Feed per Tooth f_z : 0.011"
 Feed Rate: 50.6 IPM
 Depth of cut a_p : 0.125"

40% Increase in Productivity

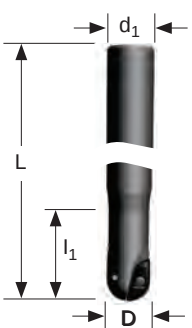


5505VX Heavy Duty Ball Nose Cutters





Weldon Shank



Cylindrical Shank



Modular Head



Depth of Cut (ap)

Product		Dimensions (inch)						Spares				
EDP	Item Description	D	L/H	l ₁	d ₁	ap max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.
5505VX Weldon Shank												
030823	C5505VX06WA.750R2.00	0.750	4.282	2.000	1.000	0.750	2	030672	FP3007T	031451	TP8	16.00
030824	C5505VX08WA1.00R2.37	1.000	4.650	2.370	1.000	1.000	2	015262	D4010T	015240	T15	27.40
030825	C5505VX08WA1.00R3.55	1.000	5.830	3.550	1.000	1.000	2	015262	D4010T	015240	T15	27.40
030826	C5505VX10WA1.25R3.00	1.250	5.250	3.000	1.250	1.250	2	015266	D5013T	015241	T20	53.10
030827	C5505VX10WA1.25R4.00	1.250	6.280	4.000	1.250	1.250	2	015266	D5013T	015241	T20	53.10
030828	C5505VX12WA1.50R4.00	1.500	6.687	4.000	1.500	1.500	2	029640	D6014T	015241	T20	93.00
030829	C5505VX12WA1.50R6.00	1.500	8.687	6.000	1.500	1.500	2	029640	D6014T	015241	T20	93.00
030830	C5505VX16WA2.00R4.00	2.000	6.687	4.000	1.500	2.000	2	029641	F8017S	018288	KH5005	216.00
030831	C5505VX16WA2.00R6.00	2.000	9.250	6.000	2.000	2.000	2	029641	F8017S	018288	KH5005	216.00
5505VX Cylindrical Shank												
031088	C5505VX05CA.62R1.6	0.625	5.500	1.575	0.625	0.625	2	031448	FP3006T	031451	TP8	16.00
030988	C5505VX05CA.75/.62R1	0.625	7.000	1.181	0.750	0.625	2	031448	FP3006T	031451	TP8	16.00
030989	C5505VX06CA.75R1.7	0.750	5.000	2.000	0.750	0.750	2	030672	FP3007T	031451	TP8	16.00
030990	C5505VX06CA1/.75R1.5	0.750	8.000	1.574	1.000	0.750	2	030672	FP3007T	031451	TP8	16.00
030991	C5505VX08CA1.00R2.2	1.000	10.000	2.165	1.000	1.000	2	015262	D4010T	015240	T15	27.40
030992	C5505VX10CA1.25R2.2	1.250	10.000	2.165	1.250	1.250	2	015266	D5013T	015241	T20	53.10

Product		Dimensions (inch)						Spares				
EDP	Item Description	D	L/H	M	d ₁	ap max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.
5505VX Modular Head												
030833	A5505VX05SA.625R1.00	0.625	1.000	M8	0.335	0.625	2	031448	FP3006T	031451	TP8	16.00
030834	A5505VX06SA.750R1.377	0.750	1.377	M10	0.413	0.750	2	030672	FP3007T	031451	TP8	16.00
030835	A5505VX08SA1.00R1.575	1.000	1.575	M12	0.492	1.000	2	015262	D4010T	015240	T15	27.40
030836	A5505VX10SA1.25R1.968	1.250	1.968	M16	0.669	1.250	2	015266	D5013T	015241	T20	53.10

Note: For cylindrical shank extensions in high density alloy with through coolant refer to page 74.

Note: Do not remove the radial screw; this is a fixed location for the insert see page 72.


5505VX Technical Information (inch)

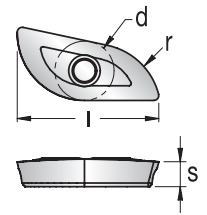
Product		Dimensions					
EDP	Item Description	Facing Pitch	Ramping Angle °	Helical Hole min. - max.		a _p max Helical / Linear	Max RPM
030823	C5505VX06WA.750R2.00	-	85	-	-	-	37,250
030824	C5505VX08WA1.00R2.37	-	85	-	-	-	30,250
030825	C5505VX08WA1.00R3.55	-	85	-	-	-	30,250
030826	C5505VX10WA1.25R3.00	-	85	-	-	-	23,500
030827	C5505VX10WA1.25R4.00	-	85	-	-	-	23,500
030828	C5505VX12WA1.50R4.00	-	85	-	-	-	19,000
030829	C5505VX12WA1.50R6.00	-	85	-	-	-	19,000
030830	C5505VX16WA2.00R4.00	-	85	-	-	-	16,750
030831	C5505VX16WA2.00R6.00	-	85	-	-	-	16,750
031088	C5505VX05CA.62R1.6	-	85	-	-	-	54,250
030988	C5505VX05CA.75/.62R1	-	85	-	-	-	54,250
030989	C5505VX06CA.75R1.7	-	85	-	-	-	37,250
030990	C5505VX06CA1/.75R1.5	-	85	-	-	-	37,250
030991	C5505VX08CA1.00R2.2	-	85	-	-	-	30,250
030992	C5505VX10CA1.25R2.2	-	85	-	-	-	23,500
030833	A5505VX05SA.625R1.00	-	85	-	-	-	54,250
030834	A5505VX06SA.750R1.377	-	85	-	-	-	37,250
030835	A5505VX08SA1.00R1.575	-	85	-	-	-	30,250
030836	A5505VX10SA1.25R1.968	-	85	-	-	-	23,500



Ramping



Product			Application & Material			Dimensions (inch)				
EDP	Item Description	Grade	Roughing ▼	Semi-Finishing ▼▼	Finishing ▼▼▼	d (IC)	l	s	r	h _m min
			Depth of Cut (inch)							
			a _p max.*	a _e / a _p max. 10% of the cutter diameter	a _e / a _p max. -					
030737	XPNT05/0522.R-F	SP6519	◆◆◆◆◆	◆◆◆◆◆	-	0.291	0.685	0.125	0.312	0.002
030740	XPNT06/062.51.5.R-F	SP6519	◆◆◆◆◆	◆◆◆◆◆	-	0.336	0.783	0.156	0.375	0.002
030746	XPNT08/0832.R-F	SP6519	◆◆◆◆◆	◆◆◆◆◆	-	0.433	1.023	0.187	0.500	0.002
030749	XPNT10/1043.R-F	SP6519	◆◆◆◆◆	◆◆◆◆◆	-	0.555	1.315	0.249	0.625	0.002
030752	XPNT12/1254.R-F	SP6519	◆◆◆◆◆	◆◆◆◆◆	-	0.669	1.575	0.312	0.750	0.002
030758	XPNT16/1654.R-F	SP6519	◆◆◆◆◆	◆◆◆◆◆	-	0.875	2.081	0.336	1.000	0.002



Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 73.

* Note: a_p max. is dependent on several insert sizes, see steel cutter pages 68 for a_p max.

5505VX Feeds f _z (inch/tooth)																		
Tool Diameter	Geometry	Grade	Operation	Unalloyed Steel	Alloyed Steel	Stainless Steel	Stainless Steel Refractory PH	Gray Iron	Spheroidal-Ductile Iron	Malleable Iron	Aluminum & Alloys <16% Si 116 HBN	Aluminum & Silicon >16% Si 92 HBN	HTA Iron Based Alloys	HTA Cobalt Based Alloys	HTA Nickel Based Alloys	HTA Titanium Based Alloys	Hard Steel >1400 N/mm ² >415 HBN	Chilled Cast Iron >1400 N/mm ² >400 HBN
				Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.
0.625	R-F	SP6519	Contouring	0.002 - 0.006	0.002 - 0.005	0.002 - 0.004	0.002 - 0.004	0.002 - 0.006	0.002 - 0.006	0.002 - 0.006	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.002 - 0.004	-	-
0.750	R-F	SP6519	Contouring	0.002 - 0.007	0.002 - 0.006	0.002 - 0.006	0.002 - 0.005	0.002 - 0.007	0.002 - 0.007	0.002 - 0.007	-	-	0.002 - 0.004	0.002 - 0.004	0.002 - 0.004	0.002 - 0.005	-	-
1.000	R-F	SP6519	Contouring	0.002 - 0.008	0.002 - 0.007	0.002 - 0.006	0.002 - 0.006	0.002 - 0.008	0.002 - 0.008	0.002 - 0.008	-	-	0.002 - 0.005	0.002 - 0.005	0.002 - 0.005	0.002 - 0.005	-	-
1.250	R-F	SP6519	Contouring	0.002 - 0.009	0.002 - 0.008	0.002 - 0.007	0.002 - 0.007	0.002 - 0.009	0.002 - 0.009	0.002 - 0.009	-	-	0.002 - 0.006	0.002 - 0.006	0.002 - 0.006	0.002 - 0.007	-	-
1.500	R-F	SP6519	Contouring	0.002 - 0.010	0.002 - 0.009	0.002 - 0.009	0.002 - 0.008	0.002 - 0.010	0.002 - 0.010	0.002 - 0.010	-	-	0.002 - 0.007	0.002 - 0.007	0.002 - 0.007	0.002 - 0.009	-	-
2.000	R-F	SP6519	Contouring	0.002 - 0.011	0.002 - 0.010	0.002 - 0.009	0.002 - 0.009	0.002 - 0.011	0.002 - 0.011	0.002 - 0.011	-	-	0.040 - 0.008	0.002 - 0.008	0.002 - 0.008	0.002 - 0.009	-	-

Note: HTA = High Temperature Alloys

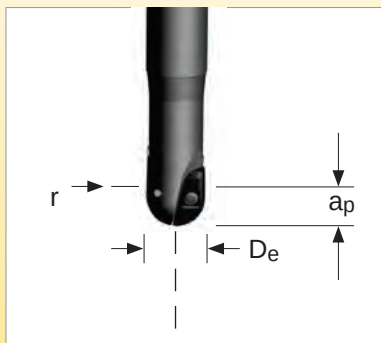
Speed recommendations can be found on page 71.



Speed v_c (SFM)					
5505VX Series			Speed min. - max..		
Coolant Recommendation					PVD Standard
Recommended ● Possible ◎					
ISO	Materials	Rm and Hardness			SP6519
P	Unalloyed Steel	<600 N/mm ² <180 HBN	◎	●	425 - 970
		<950 N/mm ² <280 HBN			375 - 855
	Alloyed Steel	700-950 N/mm ² 200-280 HBN	◎	●	330 - 755
		950-1200 N/mm ² 280-355 HBN			245 - 575
		1200-1400 N/mm ² 355-415 HBN		●	165 - 360
M	Stainless Steel	Austenitic + Ferritic 300 series	◎	●	375 - 885
		Martensitic 400 series			345 - 770
	PH Stainless	Refractory P.H.	●		165 - 395
K	Cast Iron	Grey GG-Ft	◎	●	460 - 970
		Spheroidal-Ductile GGG-FGS			360 - 785
		Malleable GTS - MN/MP			330 - 720
N	Aluminum & Alloys	Aluminum & Alloys < 16% Si 116 HBN			
		Aluminum + Silicon > 16% Si 92 HBN			
S	High Temperature Alloys	Iron Based	●		75 - 180
		Cobalt Based			70 - 160
		Nickel Based			80 - 180
		Titanium Based			120 - 260
H	Hard Materials	Hard Steel >1400 N/mm ² >415 HBN			
		Chilled Cast Iron >1400 N/mm ² > 400 HBN			



5505VX Technical Information



Working Diameter:

$$D_e = 2 \times \sqrt{r^2 - (r - a_p)^2}$$

where: D_e = Working Diameter
 r = Cutter radius
 a_p = Axial Depth of Cut



5505VX Technical Information

where:

f_z = Feed per tooth

h_m = Average chip thickness

r = Insert radius

a_e = Radial Depth of Cut

a_p = Axial Depth of Cut

Average chip thickness: h_m

$$h_m = f_z \times \frac{\sqrt{r^2 - (r - a_e)^2}}{r} \times \frac{\sqrt{r^2 - (r - a_p)^2}}{r}$$

To find programmed feedrate: f_z

$$f_z = \frac{h_m}{\frac{\sqrt{r^2 - (r - a_e)^2}}{r} \times \frac{\sqrt{r^2 - (r - a_p)^2}}{r}}$$



Please do not try to remove this screw. This screw is glued into the body to keep the inserts in the correct position.



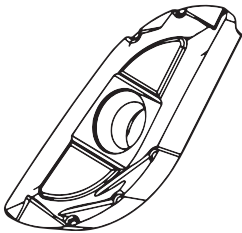
Case History



Material: Titanium 6-4
 Component: Valve Body
 Industry: Oil & Gas
 Cutter: 5505VX (1.0" Cutter)
 Insert Grade: SP6519
 RPM: 1,469
 Cutting Speed V_C : 380 SFM
 Feed per Tooth f_z : 0.005"
 Feed Rate: 15.5 IPM
 Depth of cut a_p : 0.059"

Helical Interpolation Doubled Productivity

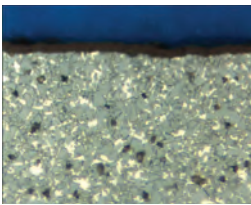
Ball Nose Geometry



-F 

This geometry is a roughing ball nose fully ground insert for roughing and semi-finishing of all materials except Aluminum. This geometry is designed with chip grooves for better chip control.

Ball Nose Grade



SP6519 

Coating Type: PVD, TiAlN

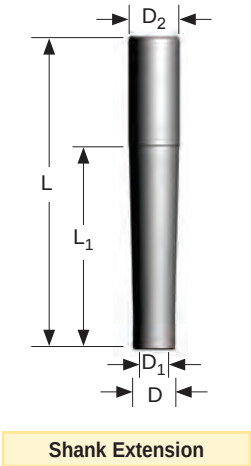
The combination of a tough substrate with a new generation of TiAlN super nano coating, makes this new PVD coating virtually free of residual stress and extremely hard for unmatched performance.

Primarily used in Stainless Steel, High Temperature Alloys & Titanium with stable conditions. Also can be used in Steel, Steel Alloys and Cast Irons.

Material Guide – Key to Recommended Inserts

Material Designation

 Unalloyed Steels  Alloyed Steels  Stainless Steels  PH Stainless  Cast Irons  Aluminum & Alloys  High Temp. Alloys  Hard Materials



Product		Dimensions (inch)					
EDP	Item Description	L	L ₁	D ₂	D	D ₁	M
030641	M-13-M8-CA.625-3.543	3.543	1.600	0.625	0.512	0.335	M8
030642	M-13-M8-CA.625-4.331	4.331	2.500	0.625	0.512	0.335	M8
030643	M-13-M8-CA.625-5.118	5.118	3.000	0.625	0.512	0.335	M8
030644	M-13-M8-CA.625-6.693	6.693	4.750	0.625	0.512	0.335	M8
030645	M-18-M10-CA.750-4.331	4.331	2.500	0.750	0.709	0.413	M10
030646	M-18-M10-CA.750-5.118	5.118	3.000	0.750	0.709	0.413	M10
030647	M-18-M10-CA.750-6.693	6.693	4.750	0.750	0.709	0.413	M10
030648	M-21-M12-CA1-5.157	5.157	3.000	1.000	0.827	0.492	M12
030649	M-21-M12-CA1-6.142	6.142	4.000	1.000	0.827	0.492	M12
030650	M-21-M12-CA1-7.126	7.126	5.000	1.000	0.827	0.492	M12
030651	M-21-M12-CA1-8.110	8.110	6.000	1.000	0.827	0.492	M12
030652	M-21-M12-CA1-9.094	9.094	7.000	1.000	0.827	0.492	M12
030653	M-29-M16-CA1.25-6.3	6.300	4.000	1.250	1.411	0.669	M16
030654	M-29-M16-CA1.25-8.27	8.268	6.000	1.250	1.411	0.669	M16
030655	M-29-M16-CA1.25-10.2	10.236	8.000	1.250	1.411	0.669	M16
030656	M-29-M16-CA1.25-12.2	12.205	10.000	1.250	1.411	0.669	M16

Note: Order example with cylindrical shank: M-13-M8-CA.625-3.543

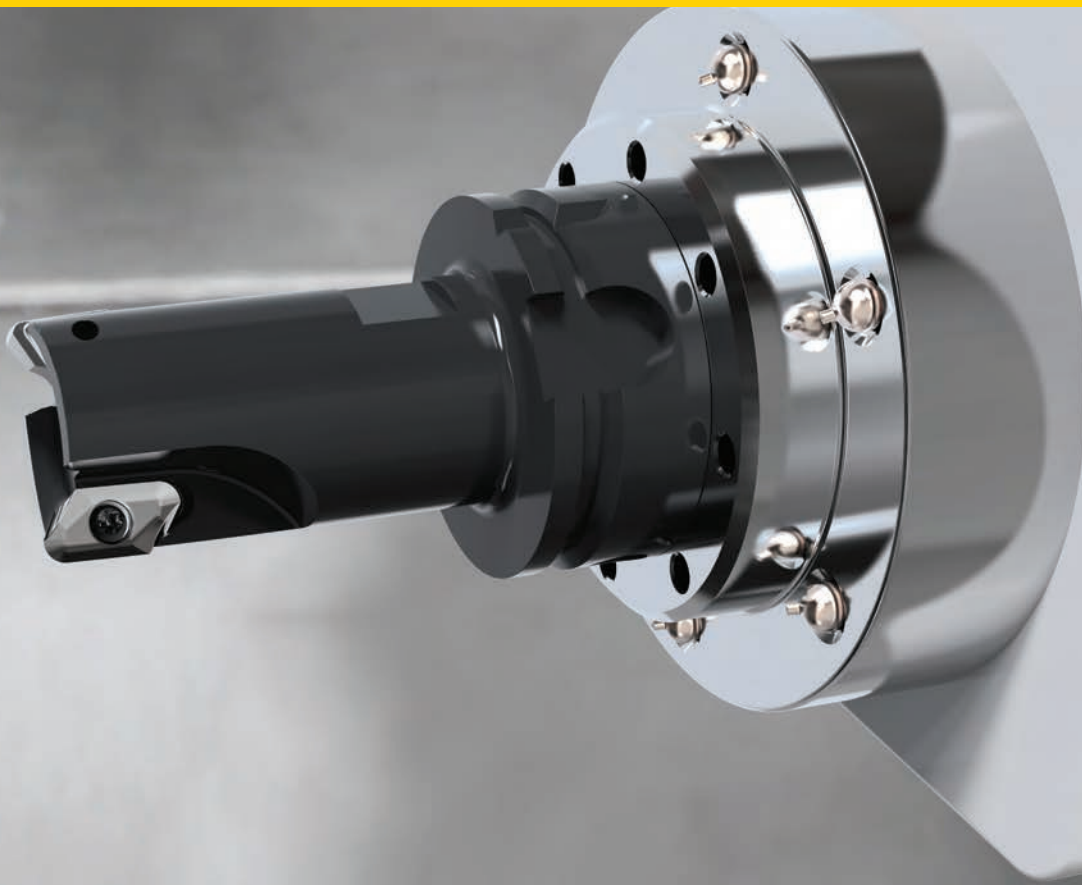


Cylindrical shank extensions can be used with all modular heads found in several product family series within this catalog.

These extensions have the industry standard of metric threads.

Technical Advice

M	Modular adapter
13	Diameter in front of the modular shank (D) 0.512" (13mm)
M8	Metric Thread (M)
CA.625	Cylindrical shank diameter 0.625" with through coolant
3.543	Total length of the body in Inches



5700 Profile Pocket Milling: Aluminum

Taking extreme high speed aluminum machining to the highest level



5700 Series High Speed Aluminum Cutters

5702 Up to 43,000 RPM

Cylindrical

0.750"



5720 Up to 51,000 RPM

Cylindrical

1.0" – 1.250"



Modular

1.0" - 1.250"



Shell

1.500" – 3.0"



Extreme Metal Removal to fit your application

- Especially designed for machining pockets and profiles on Aluminum and Aluminum Alloys
- Each series is designed, manufactured and tested in accordance with EN ISO 15641:2001 to ensure maximum stability in high speed applications
- Each features internal coolant allowing better chip evacuation and higher feed rates
- The pockets are reinforced to allow for heavy feeding and safe ramping during machining
- Excellent tools for thin-walled machining
- HSK specials available upon request

Cylindrical Shank and special HSK Integral Shanks are balanced to G6.3 @ 30,000 RPM for diameters up to 2.0". Diameters larger than 2.0" are balanced to G6.3 @ 24,000 RPM.

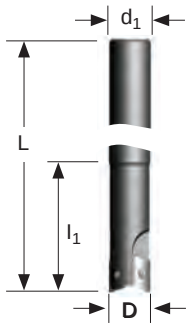
5702 inserts: 5 radii available. The -701 fully ground geometry allows contour finishing of composites and Titanium Alloys.

5720 inserts: 12 different radii are available, each with the same cutting depth capacity of 0.630".



5720 Patented Series Extreme High Speed Aluminum Cutters





Cylindrical Shank

Product		Dimensions (inch)							Spares				
EDP	Item Description	D	L	l ₁	d ₁	a _p max	No. of Teeth	Insert radius range	EDP		EDP		Screw Tightening in. lbs.*
5702VZD14 Cylindrical Shank													
028995	C5702VZD14CA.75R2.3-2	0.750	4.281	2.250	0.750	0.472	2	< 0.079	015060	F2505T	018488	T7	7.08
029008	C5702VZD14CA.75R2.3-4	0.750	4.281	2.250	0.750	0.472	2	0.098 to 0.157	015060	F2505T	018488	T7	7.08

* It is important to change the screw each time the insert is changed to ensure the highest security. A dynamometric key and the right torque value are important. See above for the correct torque information.

5702VZD Technical Information (inch)

Product		Dimensions					
EDP	Item Description	Facing Pitch	Ramping Angle °	Helical Hole min. - max.		a _p max Helical / Linear	Max RPM
028995	C5702VZD14CA.75R2.3-2	0.750	11.0*	0.981	1.421	0.120	43,000
029008	C5702VZD14CA.75R2.3-4	0.750	11.0*	0.981	1.421	0.120	43,000

* Max. ramping angle for insert is calculated with facet

Find the different ramping angles for all available insert radii on technical information page 84.

Radial depth of cut = 0.008" up to full cutter diameter.

These tools have been designed, manufactured and tested in accordance with EN ISO standard 15641:2001

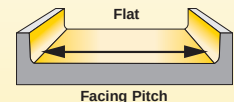
These tools are stocked without an electronic chip.

Note: If using a insert with radius, then the facing pitch for the 5702VZD cutter is equal to the cutting diameter (D) minus 2 x chosen radius.

Cylindrical Shanks or Special HSK Integral Shanks are designed and balanced to G6.3 at 30,000 RPM for diameters 2.000" and below. Diameters larger then 2.000" are balanced to G6.3 at 24,000 rpm.

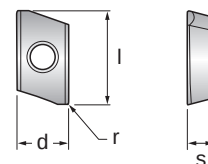
Cylindrical Shank tools mounted in a shrink fit holder or any other mill chuck holder + inserts + screws must be re-inspected for balance as an assembly by the end user when at or exceeding 8,000 rpm. End user must balance the assembly to a G6.3 value minimum.

Additional Balancing and Torque values can be found in the technical section pages 86.

Depth of Cut (a_p)



ZDCX14-701



Product			Application & Material			Dimensions (inch)				
EDP	Item Description	Grade	Roughing ▼	Semi-Finishing ▼▼	Finishing ▼▼▼	d (IC)	l	s	r	h _m min
			Depth of Cut (inch)							
			a _p max. 0.472*	a _p min. - max. 0.040 - 0.160	a _p min. - max. 0.008 - 0.040					
029027	ZDCX1403PDFR-701	GH1	◆	◆	◆	0.299	0.663	0.125	Facet	0.001
029028	ZDCX140320FR-701	GH1	◆	◆	◆	0.299	0.663	0.125	0.079	0.001
026019	ZDCX140325FR-701	GH1	◆	◆	◆	0.299	0.663	0.125	0.098	0.001
029029	ZDCX140330FR-701	GH1	◆	◆	◆	0.299	0.663	0.125	0.118	0.001
026020	ZDCX140340FR-701	GH1	◆	◆	◆	0.299	0.663	0.125	0.157	0.001

Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 87.

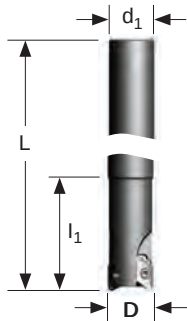
* Max. possible a_p of 0.472" and a_e is full diameter (depending on the application).

* For slotting applications with 5702VZD14 series the maximum a_p on page 83.

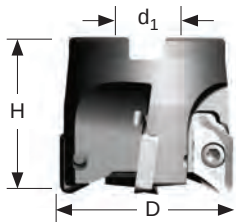


5702VZD Feeds f _z (inch/tooth)					
Size	Geometry	Grade	Operation	Aluminum & Alloys <16% Si 116 HBN	Aluminum & Silicon >16% Si 92 HBN
				Min. - Max.	Min. - Max.
14mm	FR-701	GH1	Profile/ Pocketing	0.001 - 0.010	0.001 - 0.008

Speed v_c (SFM)					
5702VZD Series			K10-K20/C3 - C2 ISO / ANSI		
			Speed min. - max.		
Coolant Recommendation			Uncoated Micrograin		
Recommended ● Possible ○					
ISO	Materials	Rm and Hardness			GH1
N	Aluminum & Alloys	Aluminum & Alloys < 16% Si 116 HBN			1310 - 10005
		Aluminum & Silicon > 16% Si 92 HBN			970 - 8005



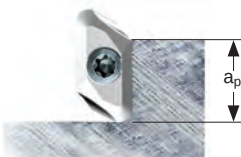
Cylindrical Shank



Shell Mill Fixation



Modular Head



Depth of Cut (ap)

Product		Dimensions (inch)							Spares				
EDP	Item Description	D	L/H	l ₁	d ₁	ap max	No. of Teeth	Insert radius range	EDP		EDP		Screw Tightening in. lbs.*

5720VZ16 Cylindrical Shank - Coarse and Medium Pitch

034613	C5720VZ16CA1.0Z2R2.75	1.000	5.030	2.750	1.000	0.630	2	Facet to 0.236	030820	DP5009A	030819	TP20	53.10
034622	C5720VZ16CA1.25Z2R3.0	1.250	5.280	3.000	1.250	0.630	2	Facet to 0.236	030820	DP5009A	030819	TP20	53.10
031664	C5720VZ16CA1.25Z3R3.0	1.250	5.280	3.000	1.250	0.630	3	Facet to 0.236	030820	DP5009A	030819	TP20	53.10

5720VZ16 Shell Mill Fixation - Coarse and Medium Pitch

034620	C5720VZ16-A1.50Z03R	1.500	1.574	-	0.500	0.630	3	Facet to 0.236	030820	DP5009A	030819	TP20	53.10
031332	C5720VZ16-A2.00Z03R	2.000	1.574	-	0.750	0.630	3	Facet to 0.236	030820	DP5009A	030819	TP20	53.10
031333	C5720VZ16-A2.00Z04R	2.000	1.574	-	0.750	0.630	4	Facet to 0.236	030820	DP5009A	030819	TP20	53.10
031334	C5720VZ16-A2.50Z04R	2.500	1.574	-	1.000	0.630	4	Facet to 0.236	030820	DP5009A	030819	TP20	53.10
031335	C5720VZ16-A2.50Z05R	2.500	1.574	-	1.000	0.630	5	Facet to 0.236	030820	DP5009A	030819	TP20	53.10
031336	C5720VZ16-A3.00Z04R	3.000	1.970	-	1.000	0.630	4	Facet to 0.236	030820	DP5009A	030819	TP20	53.10
031337	C5720VZ16-A3.00Z05R	3.000	1.970	-	1.000	0.630	5	Facet to 0.236	030820	DP5009A	030819	TP20	53.10

* It is important to change the screw each time the insert is changed to ensure the highest security.
A dynamometric key and the right torque value are important. See above for the correct torque information.

Product		Dimensions (inch)							Spares				
EDP	Item Description	D	L/H	M	d ₁	ap max	No. of Teeth	Insert radius range	EDP		EDP		Screw Tightening in. lbs.*

5720VZ16 Modular Head - Coarse and Medium Pitch

034615	A5720VZ16SA1.00Z2R2	1.000	1.970	M12	0.492	0.630	2	Facet to 0.236	030820	DP5009A	030819	TP20	53.10
034621	A5720VZ16SA1.25Z2R2	1.250	1.970	M16	0.669	0.630	2	Facet to 0.236	030820	DP5009A	030819	TP20	53.10
031640	A5720VZ16SA1.25Z3R2	1.250	1.970	M16	0.669	0.630	3	Facet to 0.236	030820	DP5009A	030819	TP20	53.10

* It is important to change the screw each time the insert is changed to ensure the highest security.
A dynamometric key and the right torque value are important. See above for the correct torque information.

Note: For cylindrical shank extensions in high density alloy with through coolant refer to page 88.


5720VZ Technical Information (inch)

Product		Dimensions				
EDP	Item Description	Facing Pitch	Ramping Angle °	Helical Hole min. - max.		Max RPM
034613	C5720VZ16CA1.0Z2R2.75	1.000	14.7*	1.193	1.921	50,000
034622	C5720VZ16CA1.25Z2R3.0	1.250	11.5*	1.693	2.421	41,500
031664	C5720VZ16CA1.25Z3R3.0	1.250	11.5*	1.693	2.421	41,500
034620	C5720VZ16-A1.50Z03R	1.500	8.1*	2.193	2.921	36,500
031332	C5720VZ16-A2.00Z03R	2.000	7.8*	3.193	3.921	30,000
031333	C5720VZ16-A2.00Z04R	2.000	7.8*	3.193	3.921	30,000
031334	C5720VZ16-A2.50Z04R	2.500	5.8*	4.193	4.921	26,000
031335	C5720VZ16-A2.50Z05R	2.500	5.8*	4.193	4.921	26,000
031336	C5720VZ16-A3.00Z04R	3.000	4.6*	5.193	5.921	23,000
031337	C5720VZ16-A3.00Z05R	3.000	4.6*	5.193	5.921	23,000
034615	A5720VZ16SA1.00Z2R2	1.000	14.7*	1.193	1.921	50,000
034621	A5720VZ16SA1.25Z2R2	1.250	11.5*	1.693	2.421	41,500
031640	A5720VZ16SA1.25Z3R2	1.250	11.5*	1.693	2.421	41,500

* Max. ramping angle for insert is calculated with facet

Find the different ramping angles for all available insert radii on technical information page 84.

Radial depth of cut = 0.008" up to full cutter diameter.

These tools have been designed, manufactured and tested in accordance with EN ISO standard 15641:2001

These tools are stocked without an electronic chip.

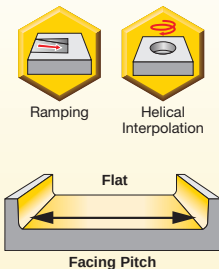
Note: If using a insert with radius, then the facing pitch for the 5702VZ cutter is equal to the cutting diameter (D) minus 2 x chosen radius.

Cylindrical Shanks or Special HSK Integral Shanks are designed and balanced to G6.3 at 30,000 RPM for diameters 2.000" and below. Diameters larger then 2.000" are balanced to G6.3 at 24,000 rpm.

Cylindrical Shank tools mounted in a shrink fit holder or any other mill chuck holder + inserts + screws must be re-inspected for balance as an assembly by the end user when at or exceeding 8,000 rpm. End user must balance the assembly to a G6.3 value minimum.

Shell Mills and Modular Heads are not balanced. These tools must be re-inspected for balance as an assembly, cutter + adapter + inserts + screws by the end user when at or exceeding 8,000 rpm. End user must balance the assembly to a G6.3 value minimum.

Additional Balancing and Torque values can be found in the technical section pages 86.





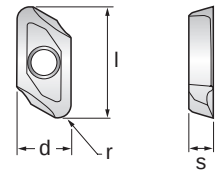
ZDET16-721

Product			Application & Material			Dimensions (inch)				
EDP	Item Description	Grade	Roughing ▼	Semi-Finishing ▼▼	Finishing ▼▼▼	d (IC)	l	s	r	h _m min
			Depth of Cut (inch)							
			a _p max. 0.630*	a _p min. - max. 0.040 - 0.200	a _p min. - max. 0.008 - 0.040					
030927	ZDET16M5PDFR-721	GH1	◆	◆	◆	0.445	0.902	0.197	Facet	0.001
031384	ZDET16M504FR-721	GH1	◆	◆	◆	0.445	0.902	0.197	0.016	0.001
030928	ZDET16M508FR-721	GH1	◆	◆	◆	0.445	0.902	0.197	0.031	0.001
031385	ZDET16M512FR-721	GH1	◆	◆	◆	0.445	0.902	0.197	0.047	0.001
030929	ZDET16M516FR-721	GH1	◆	◆	◆	0.445	0.902	0.197	0.062	0.001
030930	ZDET16M520FR-721	GH1	◆	◆	◆	0.445	0.902	0.197	0.079	0.001
030931	ZDET16M525FR-721	GH1	◆	◆	◆	0.445	0.902	0.197	0.098	0.001
030932	ZDET16M530FR-721	GH1	◆	◆	◆	0.445	0.902	0.197	0.118	0.001
030933	ZDET16M532FR-721	GH1	◆	◆	◆	0.445	0.902	0.197	0.125	0.001
030934	ZDET16M540FR-721	GH1	◆	◆	◆	0.445	0.902	0.197	0.157	0.001
030935	ZDET16M550FR-721	GH1	◆	◆	◆	0.445	0.902	0.197	0.216	0.001
030936	ZDET16M560FR-721	GH1	◆	◆	◆	0.445	0.902	0.197	0.236	0.001

Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 87.

* Max. possible a_p of 0.630" and a_e is full diameter (depending on the application).

* For slotting applications with 5720VZ16 series please see recommendations for maximum a_p on page 84.

5720VZ Feeds f_z (inch/tooth)

Size	Geometry	Grade	Operation	Aluminum & Alloys <16% Si 116 HBN	Aluminum & Silicon >16% Si 92 HBN
				Min. - Max.	Min. - Max.
16mm	FR-721	GH1	Profile/ Pocketing	0.001 - 0.010	0.001 - 0.008

Speed v_c (SFM)

5720VZ Series			K10-K20/C3 - C2 ISO / ANSI		
			Speed min. - max.		
Coolant Recommendation					
Recommended ● Possible ◎			Uncoated Micrograin		
ISO	Materials	Rm and Hardness	GH1		
N	Aluminum & Alloys	Aluminum & Alloys < 16% Si 116 HBN	●		1310 - 10005
		Aluminum & Silicon > 16% Si 92 HBN			970 - 8005



Calculation of the average chip thickness in relation with the a_e (Radial Engagement) if a_e is less than 50% of Dia.

Formula: Program Feed Rate (f_z)

$$f_z = h_m \times \sqrt{\frac{d}{a_e}}$$

h_m = Average chip thickness

a_e = Radial engagement

f_z = Feed per tooth

d = Cutter diameter

Formula: Average Chip Thickness (h_m)

$$h_m = f_z \times \sqrt{\frac{a_e}{d}}$$

Ramping angle 5702 (inch)					
Insert ZDCX1403...FR-701 Radius inch (mm)					
Cutter Diameter	Facet	2.0mm	2.50mm	3.00mm	4.00mm
	Facet	0.079"	0.098"	0.118"	0.157"
0.750	11.0°	9.8°	9.0°	8.0°	6.3°

*For Slotting applications with 5702VZD14 series the maximum a_p is 0.240".

These tools are designed, manufactured, tested and balanced in accordance with EN ISO 15641:2001 for maximum stability in high speed applications.

Metal Removal (inch)		
Calculated for 24,000 rpm		
Diameter (inch)	Z	Qmax - in ³ /min
0.750	2	44

The chart above shows total metal removal capacity (based on 24,000 RPM) by cutter diameter and number of teeth (2).

The maximum RPM is engraved on all cutter bodies.



Calculation of the average chip thickness in relation with the a_e (Radial Engagement) if a_e is less than 50% of Dia.

Formula: Program Feed Rate (f_z)

$$f_z = h_m \times \sqrt{\frac{d}{a_e}}$$

h_m = Average chip thickness
 a_e = Radial engagement
 f_z = Feed per tooth
 d = Cutter diameter

Formula: Average Chip Thickness (h_m)

$$h_m = f_z \times \sqrt{\frac{a_e}{d}}$$

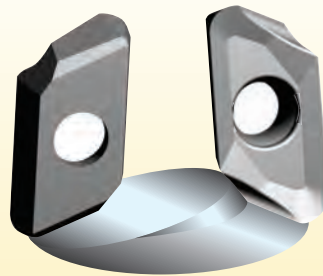
5720VZ16 Ramp Angle °

Cutter Dia. (inch)	Insert ZDET16M5... FR-721 (Radius inch)									
	mm	PDFR to R1.2	R1.6	R2.0	R2.5	R3.0	R3.2	R4.0	R5.0	R6.0
	inch	Facet 0.047	0.062	0.079	0.098	0.118	0.125	0.157	0.216	0.236
1.000	14.8	16.9	9.2	9.4	18.5	18.5	8.8	10.9	7.0	
1.250	11.5	12.1	12.1	12.4	12.7	12.7	13.4	14.0	13.6	
1.500	8.1	8.5	8.5	8.7	8.8	8.8	9.1	9.5	9.8	
2.000	7.8	7.1	7.2	7.7	7.4	7.4	8.8	8.8	9.0	
2.500	5.8	5.3	5.4	5.7	5.5	5.5	6.9	6.5	6.6	
3.000	4.6	4.3	4.3	4.6	4.4	4.4	5.4	5.1	5.2	

Possible Max a_p Slotting

Chart for maximum a_p when slotting with 5720VZ16 series		
Diameter (inch)	No. of Inserts	a_p max (inch)
1.000	2	0.300
1.250	2	0.435
1.250	3	0.240
1.500	3	0.350
2.000	3	0.435
2.000	4	0.350
2.500	4	0.435
2.500	5	0.350
3.000	4	0.435
3.000	5	0.435

a_p max in connection with: The cutter diameter, rigidity of the cutter / machine and the size of the flute.



Possible Metal Removal (inch)

Calculated for N24,000 rpm		
Diameter (inch)	Z	MRR in ³ /min
1.00	2	97
1.25	2	197
1.25	3	182.7
1.50	3	316
2.00	3	483
2.00	4	527
2.50	4	811
2.50	5	830
3.00	4	1030
3.00	5	1288

The chart above shows total metal removal capacity (based on 24,000 RPM) by cutter diameter and number of teeth.

The maximum RPM is engraved on all cutter bodies.


Machinability by Materials (Aluminum)

Alloy Group	Alloy Designation	CHEMICAL COMPOSITION LIMITS (WT%)												Typical temper	Rm (Mpa)	Machinability Chip formation	Machinability	Typical Applications	Vc SFM min. - max.	fz IPT max.
		Cu	Si	Fe	Mn	Mg	Zn	Cr	Ti	Pb	Bi	Al	Others							
Al	1050	0.05	0.25	0.4	0.5	0.05	0.05	-	-	-	-	99.50min	-	H14	105	D	A	Chemical equipment Sheet metal work Coiled tube	1970 - 9840	0.008
	1100	0.05-0.20	Si+Fe1.0max		0.05	-	0.1	-	-	-	-	99.00min	-	H14	90	D	A			
Al-Cu	2011	50-60.	0.4	0.7	-	-	0.3	-	-	0.2	0.6	remaining	-	T3	310	A	A	Screw machine products. Tuck frame. Aircraft structure. Jet engine impellers. Aircraft engine cylinder heads.	1310 - 8200	0.010
	2014	3.9-5.0	0.5-1.2	0.7	0.4-1.2	0.2-0.8	0.25	0.1	0.15	-	-	remaining	-	T6	430	B	A			
	2017	3.5-4.5	0.2-0.8	0.7	0.4-1.0	0.4-0.8	0.25	0.1	0.15	-	-	remaining	-	T4	390	B	A			
	2024	3.8-4.9	0.5	0.5	0.3-0.9	1.2-1.8	0.25	0.1	0.15	-	-	remaining	-	T4	465	B	A			
	2218	3.5-4.5	0.9	1	0.2	1.2-1.8	0.25	0.1	-	-	-	remaining	Ni1.7-2.3	T72	331	B	B			
	2224	3.8-4.4	0.12	0.15	0.30-0.9	1.2-1.8	0.25	0.1	0.15	-	-	remaining	-			A	A			
Al-Mn	3003	0.05-0.20	0.6	0.7	1.0-1.5	-	0.1	-	-	-	-	remaining	-	H14	140	D	B	Cooking utensils. Chemical equipment.	655 - 8200	0.010
Al-Si	4032	0.5-1.3	11.0-13.5	1	-	0.8-1.3	0.25	0.1	-	-	-	remaining	Ni0.5-1.3	T6	379	B	D	Pistons.	655 - 3280	0.007
Al-Mg	5052	0.1	0.25	0.4	0.1	2.2-2.8	0.1	0.15-0.35	-	-	-	remaining	-	H14	260	C	A	Architectural. Cable Sheeting. Welded pressure vessels. Hydraulic tubes.	1310 - 9840	0.010
	5056	0.1	0.3	0.4	0.05-0.20	4.5-5.6	0.1	0.05-0.20	-	-	-	remaining	H34	H12	300	C	A			
	5083	0.1	0.4	0.4	0.4-1.0	4.0-4.9	0.25	0.05-0.25	0.15	-	-	remaining	-	H112	335	C	A			
	5086	0.1	0.4	0.5	0.20-0.7	3.5-4.5	0.25	0.05-0.25	0.15	-	-	remaining	-	H32	300	C	A			
													H116							
Al-Mg-Si	6061	0.15-0.40	0.4-0.8	0.7	0.15	0.8-1.2	0.25	0.04-0.35	0.15	-	-	remaining	-	T6	300	C	B	Heavy duty structure. Furniture. Architectural. Heavy duty welded structure. Pipeline. Heat Sink.	1310 - 8200	0.008
	6063	0.1	0.2-0.6	0.35	0.1	0.45-0.9	0.1	0.1	0.1	-	-	remaining	-	T5	200	C	B			
	6070	0.15-0.40	1.0-1.7	0.5	0.40-1.0	0.50-1.2	0.25	0.1	0.15	-	-	remaining	-	T6	379	C	C			
	6151	0.35	0.6-1.2	1	0.2	0.45-0.8	0.25	0.15-0.35	0.15	-	-	remaining	-	T6		C	C			
	6262	0.15-0.40	0.4-0.8	0.7	0.15	0.8-1.2	0.25	0.04-0.14	0.15	0.4	0.7	remaining	-	T9	400	B	B			
	6351	0.1	0.7-1.3	0.5	0.4-0.8	0.40-0.8	0.2	-	0.2	-	-	remaining	-	T6	310	D	C			
	6463	0.2	0.20-0.6	0.15	0.05	0.45-0.9	0.05	-	-	-	-	remaining	-	T6	241	C	B			
Al-Zn	7001	1.6-2.6	0.35	0.4	0.2	2.6-3.4	6.8-8.0	0.18-0.35	0.2	-	-	remaining	-	O		B	A	High strength structure. Aircraft structure. Bat.	1310 - 9840	0.010
	7003	0.2	0.3	0.35	0.3	0.50-1.0	5.0-6.5	0.2	0.2	-	-	remaining	Zr0.05-0.25	T5	400	B	A			
	7050	2.0-2.6	0.12	0.15	0.1	1.9-2.6	5.7-6.7	0.04	0.06	-	-	remaining	Zr0.08-0.15	T73	530	B	A			
	7075	1.2-2.0	0.4	0.5	0.3	2.1-2.9	5.1-6.1	0.18-0.28	0.2	-	-	remaining	-	T6	570	B	A			
	7178	1.6-2.4	0.4	0.5	0.3	2.4-3.1	6.3-7.3	0.18-0.35	0.2	-	-	remaining	-	T6	600	B	A			
	7475	1.2-1.9	0.1	0.12	0.06	1.9-2.6	5.2-6.2	0.18-0.25	0.06	-	-	remaining	-	T61	565	B	A			

Machinability

- A** EXCELLENT
B GOOD-TO-EXCELLENT
C GOOD
D NOT GOOD

$$V_C = \frac{\pi \times D \times N}{12} \quad N = \frac{12 \times V_C}{\pi \times D}$$

D: Tool diameter, N: RPM, V_C: Cutting speed (SFM), π = 3.1416

Choose a cutting speed in the range of values, compatible with the cutter max rotation capacity (engraved on the body) and your spindle stability.



Recommendations for High Speed Machining at 8,000 rpm or above.

- Check spindle condition:
Runout
Balancing
Clamping of the attachment in traction
Marking and cleanliness
- Check that the tool is suitable for the required use.
- Inserts must be locked positively in the pocket and secured using the torx screw provided. The screw must be torqued to the correct value as indicated in our charts on the steel product pages 78 & 80.
For security use a new screw each time.
- Check the balancing of the – assembled tool – cutter body, inserts and attachment.
- Before start up, note the maximum RPM engraved on the tool or in our technical documents. The maximum RPM is linked to a precise balancing value.
- Ensure that the field of application of the tool shown in our technical documents and technological parameters is observed:

a_e (inch)	width of cut, lateral engagement (radial)
a_p (inch)	Axial depth of cut
f_z (inch/tooth)	Feed per tooth
n (rpm)	RPM

Stellram cannot accept responsibility for misuse of this product:

- Non observance of the above instructions
- Machine without casing
- Incorrect clamping of workpieces
- No safety device on the machine
- Any misuse or incorrect clamping

The optimum rotation must be determined by condition of the spindle. The spindle must be rigid to run at these higher RPMs.

Under no circumstances must any attempt be made to repair this tool. The only permitted maintenance is the indexing or replacement of the inserts. Use a new screw for each insert replacement.

When assembling the cutter to a shrink fit holder, the maximum protrusion can not exceed 10% of the reach of tool.

The Cutter Nomenclature Code:

Example: C-5702VZD14CA.75R2.3-2

5702	=	Stellram Product Family
V	=	Screw fixation
Z	=	Insert shape (parallelogram)
D	=	ISO insert clearance (D = 15°)
14	=	Insert edge length (14mm) 0.472"
C	=	Plain straight shank (No flats)
A	=	Through the tool coolant
.75	=	Cutting diameter (inch) .750"
R	=	Right hand tool
2.3	=	Reach of tool in (inch) 2.250"
-2	=	Maximum value of the insert radius in .004" increments (2 = .008")

This tool must only be used for the following applications: Face milling, shoulder milling, slotting and pocketing.

Cylindrical Shanks: 5702VZD14 and 5720VZ16 are designed and balanced to G6.3 at 30,000 rpm for diameters 50mm and below. Diameters larger than 50mm are stocked to G6.3 at 24,000 rpm. Cylindrical shank tools mounted in a shrink fit holder or any other mill chuck holder + inserts + screws must be re-inspected for balance by the end user when exceeding 8,000 rpm. End user must balance the assemblies to a G6.3 value minimum.

Shell Mills and Modular Heads: 5720VZ16 Shell Mills and Modular Heads are not balanced. These tools must be re-inspected for balance as an assembly, cutter + adapter + inserts + screws by the end user when at or exceeding 8,000 rpm. End user must balance the assembly to a G6.3 value minimum.

Balancing requires removing some material by drilling or milling operations. To avoid making modular heads weaker, limit these operations by avoiding high rpm.

For each new modular head added to the same extension, re-balance the assembly. For each new Shell Mill installed on the same toolholder, re-balance the assembly.

Tighten the Modular Head to the Extension, with lubricant, apply the torque value of:

Thread sizes (mm)	Torque Values Ft. Lbs.
M6	7.37
M8	22.12
M10	36.87
M12	59.00
M16	81.13

Tighten the bolt between the shell mill and tool holder, with lubricant apply the torque value of:

Thread sizes (inch)	Cutter Bore Size (inch)	Torque Values Ft. Lbs.
0.250	0.500	7.37
0.375	0.750	22.12
0.500	1.000	36.87
0.625	1.250	59.00
0.750	1.500	81.13



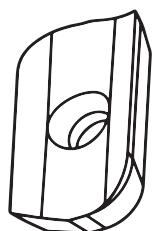
5720 Case History



Material: Aluminum 2024
 Cutter: 5720VZ (1.250" Cutter)
 Component: Seat Support
 Industry Segment: Aerospace
 Insert Grade: GH1
 Spindle Speed: 17,491 RPM
 Cutting Speed V_C : 5,680 SFM
 Feed per Tooth f_z : 0.0098"
 Feed rate: 344 IPM
 Depth of Cut: 0.098"

Result: 400% Increase in Productivity

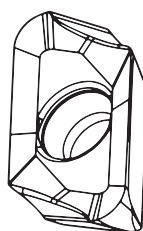
5702 High Speed Geometry



-701 

This extreme high positive geometry is highly suitable for machining Aluminum Alloys, Copper and Brass. Inserts are precision ground and deliver excellent performance when machining thin-walled components.

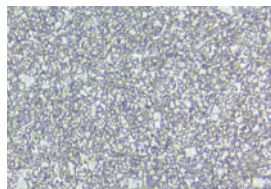
5720 High Speed Geometry



-721 

This extreme high positive geometry is highly suitable for machining Aluminum Alloys, Copper and Brass. This geometry is periphery ground with a pressed, polished top rake face reducing built up edge. Especially qualified when machining thin-walled components.

High Speed Grade



GH1 

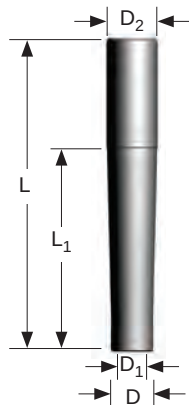
Uncoated, Micrograin

This micrograin grade is designed for use on Aluminum Alloys, Copper, Brass and Kevlar, etc. The grade GH1 works well with or without coolant with low cutting pressure at high speeds due to sharp cutting edge.

Material Guide – Key to Recommended Inserts

Material Designation

 Unalloyed Steels
  Alloyed Steels
  Stainless Steels
  PH Stainless
  Cast Irons
  Aluminum & Alloys
  High Temp. Alloys
  Hard Materials



Shank Extension

Product		Dimensions (inch)					
EDP	Item Description	L	L ₁	D ₂	D	D ₁	M
030641	M-13-M8-CA.625-3.543	3.543	1.600	0.625	0.512	0.335	M8
030642	M-13-M8-CA.625-4.331	4.331	2.500	0.625	0.512	0.335	M8
030643	M-13-M8-CA.625-5.118	5.118	3.000	0.625	0.512	0.335	M8
030644	M-13-M8-CA.625-6.693	6.693	4.750	0.625	0.512	0.335	M8
030645	M-18-M10-CA.750-4.331	4.331	2.500	0.750	0.709	0.413	M10
030646	M-18-M10-CA.750-5.118	5.118	3.000	0.750	0.709	0.413	M10
030647	M-18-M10-CA.750-6.693	6.693	4.750	0.750	0.709	0.413	M10
030648	M-21-M12-CA1-5.157	5.157	3.000	1.000	0.827	0.492	M12
030649	M-21-M12-CA1-6.142	6.142	4.000	1.000	0.827	0.492	M12
030650	M-21-M12-CA1-7.126	7.126	5.000	1.000	0.827	0.492	M12
030651	M-21-M12-CA1-8.110	8.110	6.000	1.000	0.827	0.492	M12
030652	M-21-M12-CA1-9.094	9.094	7.000	1.000	0.827	0.492	M12
030653	M-29-M16-CA1.25-6.3	6.300	4.000	1.250	1.411	0.669	M16
030654	M-29-M16-CA1.25-8.27	8.268	6.000	1.250	1.411	0.669	M16
030655	M-29-M16-CA1.25-10.2	10.236	8.000	1.250	1.411	0.669	M16
030656	M-29-M16-CA1.25-12.2	12.205	10.000	1.250	1.411	0.669	M16

Note: Order example with cylindrical shank: M-13-M8-CA.625-3.543



Cylindrical shank extensions can be used with all modular heads found in several product family series within this catalog.

These extensions have the industry standard of metric threads.

Technical Advice

M	Modular adapter
13	Diameter in front of the modular shank (D) 0.512" (13mm)
M8	Metric Thread (M)
CA.625	Cylindrical shank diameter 0.625" with through coolant
3.543	Total length of the body in Inches



5182 High Speed Long Edge Milling: Aluminum

Proven in critical applications worldwide



5182VZ: High Speed Aerospace Performance

CAT 50 Taper

Diameter Range

1.250" – 2.500"

Depth of Cut

1.250" – 2.080"



Proven in critical aerospace applications, this high speed cutter with its exceptional depth of cut performs at extremely high metal removal rates.

This design greatly reduces deformation when machining thin walled, complex components – perfect for many aerospace components.

The 5182's consistent cutting engagement assures longer tool life by reducing edge build-up, which is typical when machining thin walled sections.

- Extended tool life
- Exceptional wear resistance
- Greater precision and surface finish
- Exceptional depth of cut capabilities

Case History



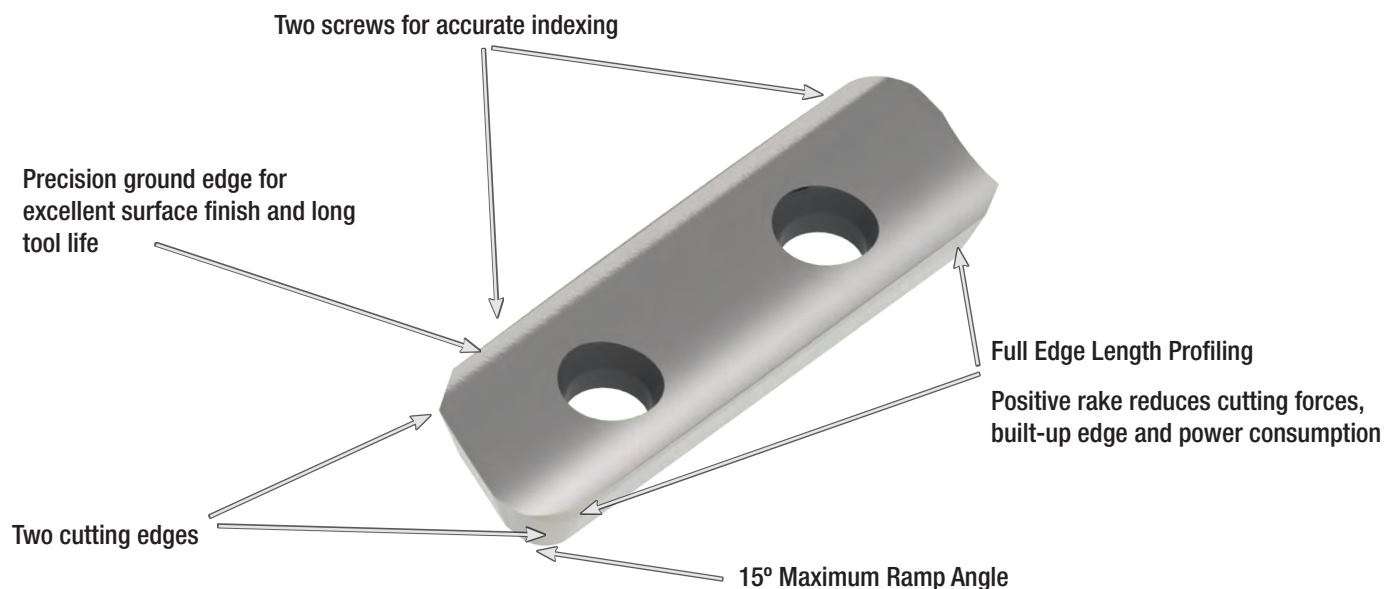
5182 Case History

Material: Aluminum 2017
 Cutter: 5182VZ (1.250" Cutter)
 Component: Hatch
 Industry: Aerospace
 Insert Grade: GH2
 RPM: 14,917
 Cutting Speed V_c : 4,920 SFM
 Feed per Tooth f_z : 0.008"
 Feed Rate: 239 IPM
 Depth of Cut a_p : 0.197"

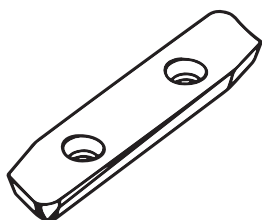
Metal Removal Rate of 960 in³ / min.



The Ultimate Aerospace Insert



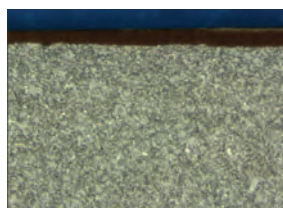
High Speed Geometry



-701 

This extreme high positive geometry is highly suitable for machining Aluminum Alloys, Copper and Brass. The -701 geometry is precision ground and gives excellent performance when machining thin-walled components.

High Speed Grade



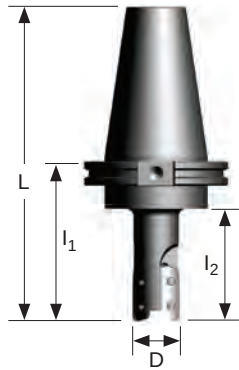
GH2 

This tough micrograin grade is excellent suitable for roughing, semi-finishing and finishing of Aluminum, Copper and Brass. Also can be used for finishing of Stainless Steel, High Temperature Alloys and Cast Iron. This grade is able to handle high pressure, vibration and shock.

Material Guide – Key to Recommended Inserts

Material Designation

 Unalloyed Steels
  Alloyed Steels
  Stainless Steels
  PH Stainless
  Cast Irons
  Aluminum & Alloys
  High Temp. Alloys
  Hard Materials



Caterpillar Vee Flange

Product		Dimensions (inch)								Spares				
EDP	Item Description	D	L	l ₁	l ₂	Taper	Radius max	a _p max	No. of Teeth	EDP		EDP		Screw Tightening in. lbs.
5182VZ32 Caterpillar Vee Flange 50 Taper														
018598	C5182VZ32FA50/1.25R3.00-4	1.250	8.375	4.375	3.000	Cat. 50	4.00	1.250	2	023144	D4008A	015240	T15	35.40
5182VZ33 Caterpillar Vee Flange 50 Taper														
018599	C5182VZ33FA50/1.50R4.00-4	1.500	9.375	5.375	4.000	Cat. 50	4.00	1.300	2	015261	D4010A	015240	T15	35.40
5182VZ53 Caterpillar Vee Flange 50 Taper														
018600	C5182VZ53FA50/2.00R4.00-4	2.000	8.750	4.750	3.375	Cat. 50	4.00	2.080	2	030820	DP5009A	030819	TP20	53.10
018601	C5182VZ53FA50/2.50R5.00-4	2.500	10.380	6.375	5000	Cat. 50	4.00	2.080	2	030820	DP5009A	030819	TP20	53.10

Note:

*Screw DP5009A & Screw driver TP20 are being used for new cutters as of production date **January 2014**.

* Old screws D5010A & screw driver T20 have to be used for cutters produced prior to production date above.

* Old screws D5010A & new screws cannot be mixed and used on the same cutter.

5182VZ Technical Information (inch)

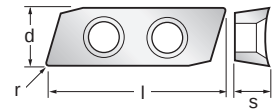
Product		Dimensions				
EDP	Item Description	Facing Pitch	Ramping Angle °	Helical Hole min. - max.		Max RPM
018598	C5182VZ32FA50/1.25R3.00-4	1.250	15.00	1.641	2.421	18,000
018599	C5182VZ33FA50/1.50R4.00-4	1.500	15.00	2.107	2.921	12,000
018600	C5182VZ53FA50/2.00R4.00-4	2.000	15.00	2.913	3.921	21,000
018601	C5182VZ53FA50/2.50R5.00-4	2.500	15.00	3.913	4.921	18,000

Note: Because the overall length of the insert is reduced, as the corner radius increases, the L, l₁, l₂ and a_p dimensions will reduce/increase as the radius size increases/reduces.

The numbers above assume a 0.157 in. corner radius.
Part number ending -4 means 0.157 in. max radius on insert.



Depth of Cut (a_p)



Product			Application & Material			Dimensions (inch)				
EDP	Item Description	Grade	Roughing ▼	Semi-Finishing ▼▼	Finishing ▼▼▼	d (IC)	l	s	r	h _m min
			Depth of Cut (inch)							
			a _e / a _p max.**	a _e min. - max. 0.040 - 0.400 a _p max.*	a _e min. - max. 0.008 - 0.040 a _p max.*					
025787	ZECX32T302ER-701	GH2	◆	◆	●●◆●	0.469	1.457	0.156	0.008	0.001
029643	ZECX32T325ER-701	GH2	◆	◆	●●◆●	0.469	1.457	0.156	0.098	0.001
017485	ZECX32T330ER-701	GH2	◆	◆	●●◆●	0.469	1.457	0.156	0.118	0.001
025788	ZECX32T340ER-701	GH2	◆	◆	●●◆●	0.469	1.457	0.156	0.157	0.001
025785	ZDCX330402ER-701	GH2	◆	◆	●●◆●	0.531	1.457	0.187	0.008	0.001
023734	ZDCX330425ER-701	GH2	◆	◆	●●◆●	0.531	1.457	0.187	0.098	0.001
025786	ZDCX330440ER-701	GH2	◆	◆	●●◆●	0.531	1.457	0.187	0.157	0.001
025770	ZDCX530402ER-701	GH2	◆	◆	●●◆●	0.583	2.520	0.187	0.008	0.001
017479	ZDCX530430ER-701	GH2	◆	◆	●●◆●	0.583	2.520	0.187	0.118	0.001
025769	ZDCX530440ER-701	GH2	◆	◆	●●◆●	0.583	2.520	0.187	0.157	0.001

Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 91.

** Max. recommended a_e/a_p = 100%; (depending on the application). For slotting = 65% of the cutter diameter.

* a_p max. is determined by the cutter selection.

5182VZ Feeds f_z (inch/tooth)

Insert Size	Radius	Operation	Grade	Unalloyed Steel	Alloyed Steel	Stainless Steel	Stainless Steel Refractory PH	Gray Iron	Spheroidal-Ductile Iron	Malleable Iron	Aluminum & Alloys <16% Si 116 HBN	Aluminum & Silicon >16% Si 92 HBN	HTA Iron Based Alloys	HTA Cobalt Based Alloys	HTA Nickel Based Alloys	HTA Titanium Based Alloys	Hard Steel >1400 N/mm ² >415 HBN	Chilled Cast Iron >1400 N/mm ² >400 HBN
				Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.	Min. - Max.
32,33 & 53	0.008	ER-701	GH2	-	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.001 - 0.010	0.001 - 0.008	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	-	-
32,33 & 53	0.098	ER-701	GH2	-	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.001 - 0.010	0.001 - 0.008	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	-	-
32,33 & 53	0.118	ER-701	GH2	-	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.001 - 0.010	0.001 - 0.008	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	-	-
32,33 & 53	0.157	ER-701	GH2	-	-	-	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.001 - 0.010	0.001 - 0.008	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003	-	-

Note: HTA = High Temperature Alloys

Speed recommendations can be found on page 94.



Speed v_c (SFM)					
5182VZ Series			Speed min. - max.		
Coolant Recommendation					Uncoated Micrograin
Recommended ● Possible ◎					
ISO	Materials	Rm and Hardness			GH1
P	Unalloyed Steel	<600 N/mm ² <180 HBN			
		<950 N/mm ² <280 HBN			
	Alloyed Steel	700-950 N/mm ² 200-280 HBN			
		950-1200 N/mm ² 280-355 HBN			
M	Stainless Steel	Austenitic + Ferritic 300 series			
		Martensitic 400 series			
	PH Stainless	Refractory P.H.	●		270 - 400
K	Cast Iron	Grey GG-Ft	◎	●	445 - 1140
		Spheroidal-Ductile GGG-FGS			395 - 805
		Malleable GTS - MN/MP			375 - 655
N	Aluminum & Alloys	Aluminum & Alloys < 16% Si 116 HBN	●		1310 - 10005
		Aluminum + Silicon > 16% Si 92 HBN			970 - 8005
S	High Temperature Alloys	Iron Based	●		150 - 190
		Cobalt Based			150 - 190
		Nickel Based			150 - 190
		Titanium Based			150 - 220
H	Hard Materials	Hard Steel >1400 N/mm ² >415 HBN			
		Chilled Cast Iron >1400 N/mm ² > 400 HBN			



Calculation of the average chip thickness in relation with the a_e (Radial Engagement) if a_e is less than 50% of dia.

Formula: Program Feed Rate (f_z)

$$f_z = h_m \times \sqrt{\frac{d}{a_e}}$$

h_m = Average chip thickness

a_e = Radial engagement

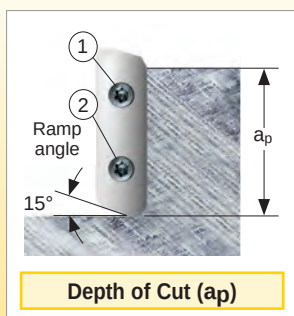
f_z = Feed per tooth

d = Cutter diameter

Formula: Average Chip Thickness (h_m)

$$h_m = f_z \times \sqrt{\frac{a_e}{d}}$$

5182VZ32 Technical Information

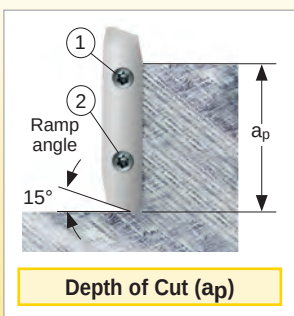


Maximum RPM when balanced = 18,000 RPM.
Maximum ramp angle = 15°

Fixing screws:

- 1) Loosely tighten screws number 1 and 2.
- 2) Tighten screw number 1 to 31-35 in. lbs.
- 3) Tighten screw number 2 to 31-35 in. lbs.

5182VZ33 Technical Information

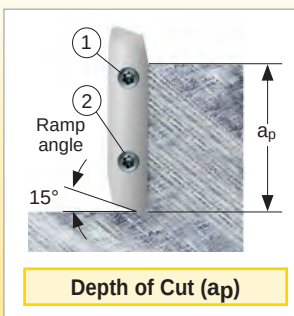


Maximum RPM when balanced = 12,000 RPM.
Maximum ramp angle = 15°

Fixing screws:

- 1) Loosely tighten screws number 1 and 2.
- 2) Tighten screw number 1 to 31-35 in. lbs.
- 3) Tighten screw number 2 to 31-35 in. lbs.

5182VZ53 Technical Information



Maximum RPM when balanced = 12,000 RPM
Maximum ramp angle = 15°

Fixing screws:

- 1) Loosely tighten screws number 1 and 2.
- 2) Tighten screw number 1 to 44-48 in. lbs.
- 3) Tighten screw number 2 to 44-48 in. lbs.

Metalcutting Safety

IMPORTANT SAFETY INSTRUCTIONS

Read before using the tools in this catalog!

Projectile and Fragmentation Hazards:

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

To avoid injury:

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

Breathing and Skin Contact Hazards:

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

To avoid injury:

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

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

These safety instructions are general guidelines. Many variables affect machining operations. It is impossible to cover every specific situation. The technical information included in this catalog and recommendations on machining practices may not apply to your particular operation. For more information, consult Kennametal's Metalcutting Safety booklet, available free from Kennametal at 724.539.5747 or fax 724.539.5439. For specific product safety and environmental questions, contact our Corporate Environmental Health and Safety Office at 724.539.5066 or fax 724.539.5372.

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Part-Off



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