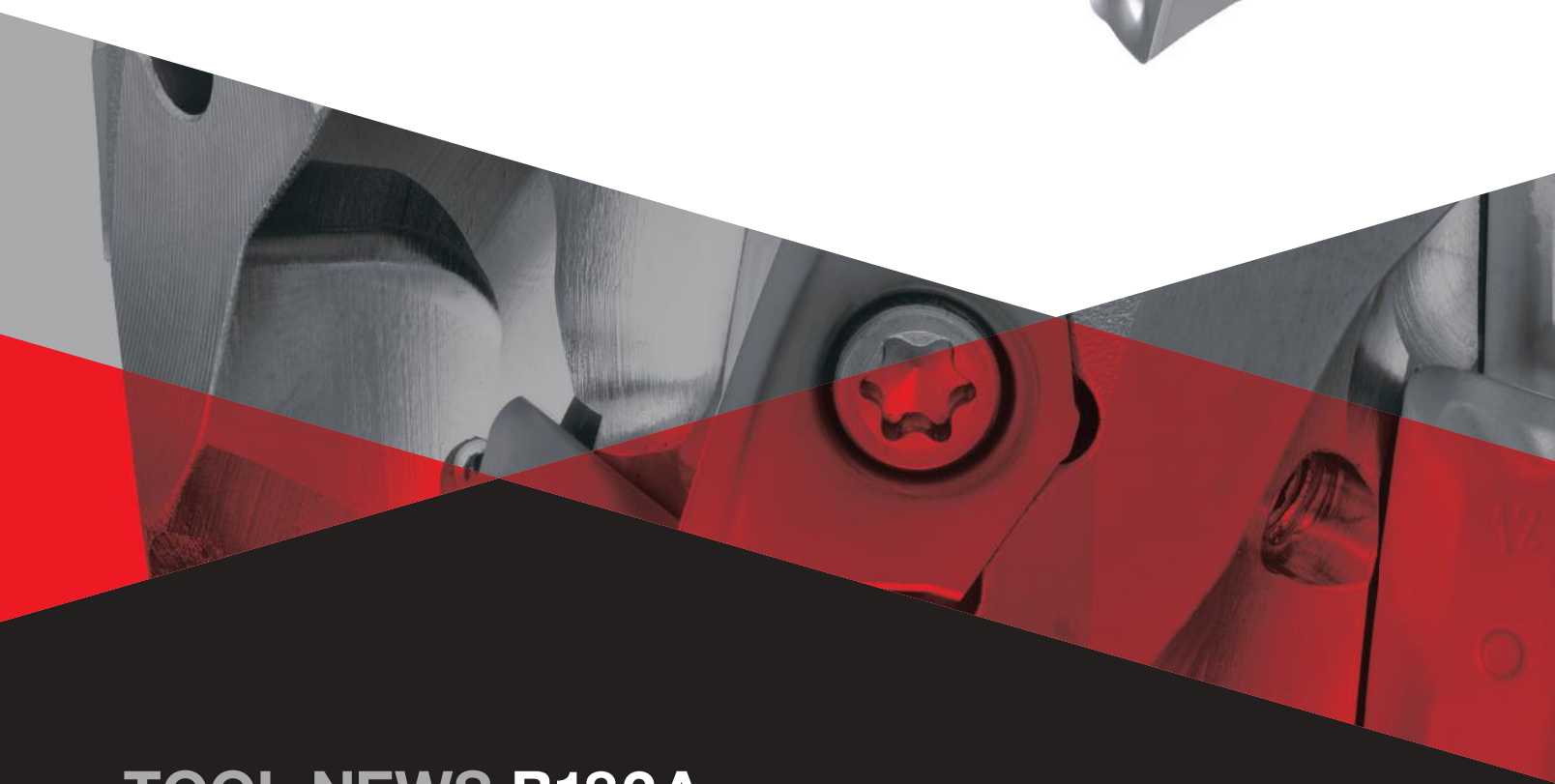
MITSUBISHI MATERIALS

VFX Series

FOR TITANIUM ALLOY MILLING





TOOL NEWS **B182A**

Unparalleled Chip Ejection Properties Helps Re-define the Parameters for Machining Titanium Alloy

VFX Series

High Rigidity Design

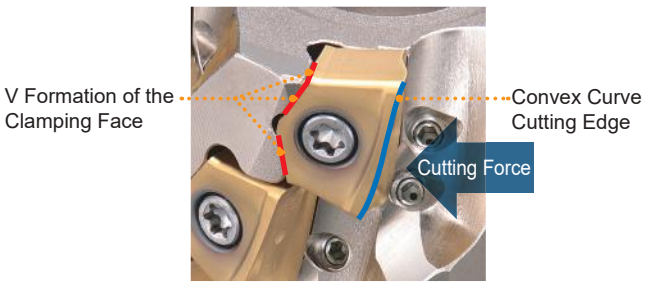
Arranging the inserts vertically absorbs the principal cutting force through the thickness of the insert and achieves extremely high rigidity.

Highly Reliable Clamping Mechanism

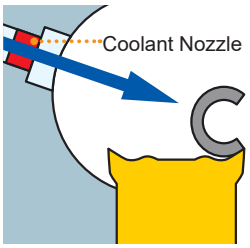
The insert seat has a curved seating face in the radial direction of the tool and a V-shaped seating face on the axis of rotation that can securely handle cutting forces from any direction.

Low Resistance Convex Curve Cutting Edge

The curved cutting edge resembles the geometry of a solid end mill and achieves low cutting resistance and enables high quality machining.



Improved Chip Removal with Coolant



Coolant Discharge Position

The internal coolant is directed slightly above the rake face of the cutting edge so that it is aimed directly at the chip. Forcibly ejecting the chips prevents them from welding to the cutting edge, enabling higher efficiency machining.

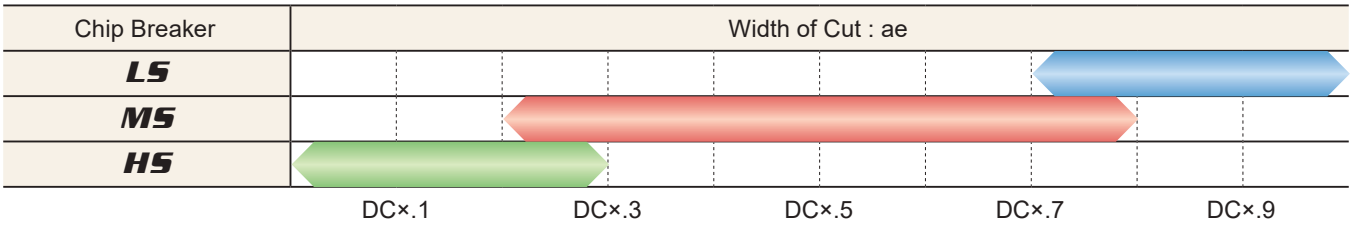
Replaceable Coolant Nozzle

A replaceable nozzle is used for the internal coolant (hole diameter of the standard nozzle supplied: ø0.8 mm or .031 inch). The coolant pressure can be adjusted by using a nozzle with a smaller or larger diameter. Nozzles with different diameters are available as options.



Selecting Inserts

LS	MS	HS
		
Produces compact chips without increasing cutting resistance. Excellent performance at large widths of cut and during slotting.	Covers a wide range of cutting conditions and applications.	Excellent chip separation and strong cutting edge. Highly efficient machining is possible at small widths of cut.



First Recommended
MP9130

A new and enhanced super fine cemented carbide substrate has increased toughness while maintaining hardness.
The Al-Ti-Cr-N accumulated type coating ensures optimum heat and wear resistance. The combination of these properties gives excellent fracture resistance and a very low coefficient of friction for class leading welding resistance when machining titanium alloy.

General Purpose Grade
MP9030

MP9030 uses an accumulated type coating based on a Ti compound that demonstrates excellent abrasion and fracture resistance during titanium alloy machining.

Combination of Holder and Insert Corner R

VFX5



Grade: MP9130 MP9030
Insert Type: MS



Grade: MP9130 MP9030
Insert Type: HS



Grade: MP9130
Insert Type: LS



VFX6



Grade: MP9130 MP9030
Insert Type: MS



Grade: MP9130 MP9030
Insert Type: HS



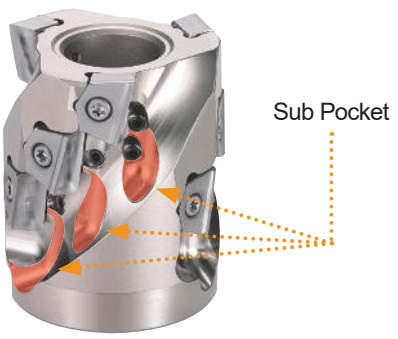
Grade: MP9130
Insert Type: LS



*Only the end cutting edge can be changed. On the peripheral cutting edges please use R.047" for VFX6 and R.031" for VFX5.

Newly Developed 3-flute Holder (VFX5 Only)

During high chip volume applications such as slotting, chip evacuation performance is important and if insufficient can lead to chipping of the insert.
To solve this problem a 3 flute cutter with maximized main flutes and chip pockets has been developed.
Use of the new LS breaker in conjunction with the 3 flute cutter will maximize the performance benefits.



DEEP SHOULDER MILLING

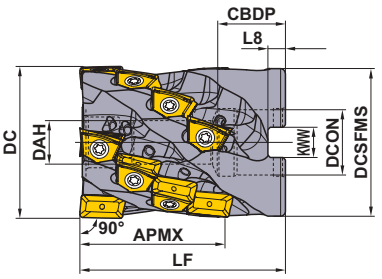
0°

Roughing

VFX5



- Vertical inserts with high strength cutting edge.
- Screw-on type clamping.
- High efficiency milling of titanium alloys.



Right hand tool holder only.

Shell Type

DC = Inch, DCON = Inch (inch)

Order Number	Stock R	No.F *	Total	DC	LF	DCON	CBDP	DAH	DCSFMS	KWW	L8	APMX	WT (lbs)
VFX5UR0203CA10	●	3	6	2.0	2.0	1.00	.95	.520	1.929	.375	.219	1.0	.20
VFX5UR0203CA15	●	3	9	2.0	2.5	1.00	1.00	.520	1.929	.375	.219	1.5	.26
VFX5UR0204AA10	●	4	8	2.0	2.0	.75	.75	.395	1.929	.313	.187	1.0	.24
VFX5UR0204AA15	●	4	12	2.0	2.5	.75	.75	.395	1.929	.313	.187	1.5	.30
VFX5UR0204CA15	●	4	12	2.0	2.5	1.00	1.00	.520	1.929	.375	.219	1.5	.27
VFX5UR0204AA20	●	4	16	2.0	2.75	.75	.75	.395	1.929	.313	.187	2.0	.32
VFX5UR0204CA20	●	4	16	2.0	3.0	1.00	1.00	.520	1.929	.375	.219	2.0	.33
VFX5UR2505CA10	●	5	10	2.5	2.5	1.00	1.25	.520	2.421	.375	.219	1.0	.49
VFX5UR2505CA24	●	5	25	2.5	3.5	1.00	1.25	.520	2.421	.375	.219	2.4	.68
VFX5UR0306DA29	●	6	36	3.0	4.25	1.25	1.375	.645	2.894	.500	.281	2.9	1.21

* No. F = Number of Flutes

Spare Parts

Order Number	Clamp Screw *2	Number	Seal Washer	Wrench	Coolant Nozzle *3	Number	Anti-seize Lubricant	Set Bolt	Number of Insert: End Cutting Edge XNMU1607 ○○R-○○	Number of Insert: Peripheral Cutting Edge *1 XNMU1607 08R-○○
VFX5UR0203CA10	TS352	6	WU500-S1	TKY10D	HSD04004H08	9	MK1KS	HSCUF50014	3	3
VFX5UR0203CA15	TS352	9	WU500-S1	TKY10D	HSD04004H08	12	MK1KS	HSCUF50018	3	6
VFX5UR0204AA10	TS352	8	WU375-S1	TKY10D	HSD04004H08	12	MK1KS	HSCUF37513	4	4
VFX5UR0204AA15	TS352	12	WU375-S1	TKY10D	HSD04004H08	16	MK1KS	HSCUF37520	4	8
VFX5UR0204CA15	TS352	12	WU500-S1	TKY10D	HSD04004H08	16	MK1KS	HSCUF50018	4	8
VFX5UR0204AA20	TS352	16	WU375-S1	TKY10D	HSD04004H08	20	MK1KS	HSCUF37520	4	12
VFX5UR0204CA20	TS352	16	WU500-S1	TKY10D	HSD04004H08	20	MK1KS	HSCUF50023	4	12
VFX5UR2505CA10	TS352	10	WU500-S1	TKY10D	HSD04004H08	15	MK1KS	HSCUF50018	5	5
VFX5UR2505CA24	TS352	25	WU500-S1	TKY10D	HSD04004H08	30	MK1KS	HSCUF50028	5	20
VFX5UR0306DA29	TS352	36	WU625-S1	TKY10D	HSD04004H08	42	MK1KS	HSCUF62535	6	30

*1. Only corner radius RE.031 can be used.
*2. Clamp Torque (lbf-in) : TS352=22
*3. The .031" nozzels are installed in the standard. Select and use alternate nozzles from below list depending on coolant pressure.

	≤140PSI (≤5.3gal/min)	←Standard→ (140PSI-720PSI)	≥720PSI (≥7.9gal/min)	≥1000PSI (≥13.2gal/min)
Nozzle Dia.	ø.024"	ø.031"	ø.047"	ø.063"
Order Number	**HSD04004H06**	**HSD04004H08**	**HSD04004H12**	**HSD04004H16**

- Clamp Torque (lbf-in) : HSD0400H○○=13
- The part number for a plug screw without a through nozzle is HSS04004.
- Insert with a corner radius of .125" and above, as corner radius increases the LF dimension increases.
  Corner radius .125": LF+.028" Corner radius .157": LF+.059"

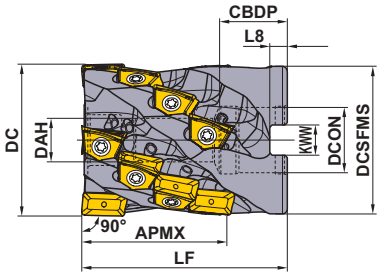
● : Inventory maintained. ★ : Inventory maintained in Japan.



Metric Standard

DC = mm, DCON = Inch

- **Vertical inserts with high strength cutting edge.**
- **Screw-on type clamping.**
- **High efficiency milling of titanium alloys.**



Right hand tool holder only.

Shell Type

(mm)

Order Number	Stock R	No.F *	Total	DC	LF	DCON	CBDP	DAH	DCSFMS	KWW	L8	APMX	WT(kg)
VFX5-040A03A026R	★	3	6	40	50	16	21	8.5	38.2	8.4	5.6	26	0.3
VFX5-040A03A038R	★	3	9	40	60	16	21	8.5	38.2	8.4	5.6	38	0.4
VFX5-050X03A026R	★	3	6	50	50	27	23	12.5	48.2	12.4	7.0	26	0.4
VFX5-050X03A038R	★	3	9	50	60	27	23	12.5	48.2	12.4	7.0	38	0.5
VFX5-050A04A026R	★	4	8	50	50	22	21	10.5	48.2	10.4	6.3	26	0.5
VFX5-050A04A038R	★	4	12	50	60	22	21	10.5	48.2	10.4	6.3	38	0.6
VFX5-050X04A038R	★	4	12	50	60	27	23	12.5	48.2	12.4	7.0	38	0.5
VFX5-050A04A050R	★	4	16	50	70	22	21	10.5	48.2	10.4	6.3	50	0.7
VFX5-063A05A026R	★	5	10	63	60	27	28	12.5	61	12.4	7.0	26	1.0
VFX5-063A05A063R	★	5	25	63	85	27	28	12.5	61	12.4	7.0	63	1.4
VFX5-080A06A075R	★	6	36	80	100	32	28	16.5	77.3	14.4	8.0	75	2.8

* No. F = Number of Flutes

Spare Parts

Order Number	*2				*3			Number of Insert	
	Clamp Screw	Number	Seal Washer	Wrench	Coolant Nozzle	Number	Anti-seize Lubricant	Set Bolt	End Cutting Edge XNMU1607 ○○R-○○	Peripheral *1 Cutting Edge XNMU1607 08R-○○
VFX5-040A03A026R	TS352	6	W8-S1	TKY10D	HSD04004H08	9	MK1KS	HSC08040	3	3
VFX5-040A03A038R	TS352	9	W8-S1	TKY10D	HSD04004H08	12	MK1KS	HSC08050	3	6
VFX5-050X03A026R	TS352	6	W12-S1	TKY10D	HSD04004H08	9	MK1KS	HSC12035	3	3
VFX5-050X03A038R	TS352	9	W12-S1	TKY10D	HSD04004H08	12	MK1KS	HSC12045	3	6
VFX5-050A04A026R	TS352	8	W10-S1	TKY10D	HSD04004H08	12	MK1KS	HSC10035	4	4
VFX5-050A04A038R	TS352	12	W10-S1	TKY10D	HSD04004H08	16	MK1KS	HSC10045	4	8
VFX5-050X04A038R	TS352	12	W12-S1	TKY10D	HSD04004H08	16	MK1KS	HSC12045	4	8
VFX5-050A04A050R	TS352	16	W10-S1	TKY10D	HSD04004H08	20	MK1KS	HSC10055	4	12
VFX5-063A05A026R	TS352	10	W12-S1	TKY10D	HSD04004H08	15	MK1KS	HSC12045	5	5
VFX5-063A05A063R	TS352	25	W12-S1	TKY10D	HSD04004H08	30	MK1KS	HSC12070	5	20
VFX5-080A06A075R	TS352	36	W16-S1	TKY10D	HSD04004H08	42	MK1KS	HSC16080	6	30

*1 Only corner radius RE0.8 can be used for the peripheral cutting edges except the end cutting edge.

*2 Clamp Torque (N • m) : TS352=2.5

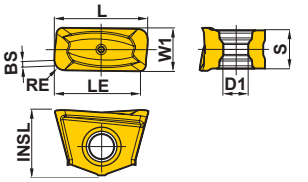
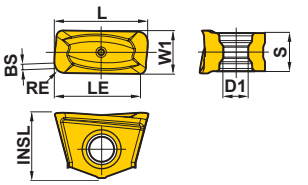
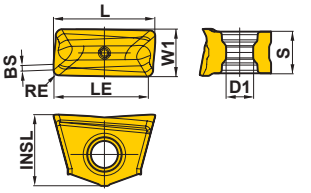
*3 Coolant nozzles are available with varying diameters for adjusting coolant pressure. Select nozzles as required by the specification.

	≤1Mpa (≤20 l/min.)	←Standard→	≥5Mpa (≥30 l/min.)	≥7Mpa (≥50 l/min.)
Nozzle Dia.	ø0.6mm	ø0.8mm	ø1.2mm	ø1.6mm
Order Number	**HSD04004H06**	**HSD04004H08**	**HSD04004H12**	**HSD04004H16**

- Clamp Torque (N • m) : HSD0400H○○=1.5
- The part number for a plug screw without a through nozzle is HSS04004.
- Insert with a corner radius of 3.2mm and above, as corner radius increases the LF dimension increases.
  Corner radius 3.2mm: LF+0.7mm Corner radius 4.0mm: LF+1.5mm

Inserts

(inch)

Shape	Order Number	Stock Coated MP9030	Stock Coated MP9130			L	LE	W1	INSL	S	BS	RE	D1	Geometry
	**XNMU160708R-MS**	●	●			.630	.528	.276	.437	.256	.039	.031	.165	
	XNMU160712R-MS	●	●			.630	.543	.276	.437	.256	.039	.047	.165	
	XNMU160716R-MS	●	●			.630	.543	.276	.437	.256	.039	.063	.165	
	XNMU160724R-MS	●	●			.630	.543	.276	.437	.256	.039	.094	.165	
	∗1 **XNMU160732R-MS**	●	●			.681	.567	.276	.437	.256	—	.126	.165	
	∗1 **XNMU160740R-MS**	●	●			.744	.598	.276	.437	.256	—	.157	.165	
	**XNMU160708R-HS**	●	●			.630	.528	.276	.437	.256	.039	.031	.165	
	**XNMU160708R-LS**		●			.630	.528	.276	.437	.256	.039	.031	.165	

∗1 Note for insert with a corner radius of .125" and above, as corner radius increases the LF dimension increases.
Corner radius .125": LF+.028" Corner radius .157": LF+.059"

● : Inventory maintained. (10 insert in one case)

Recommended Cutting Conditions

VFX5

(inch)

	Work Material	DC (inch)	Number of Flutes	Chip Breaker	vc (SFM)	n (min^{-1})	apmax	ae	fz (IPT)	vf (IPM)	Chip Removal Rate Q ($inch^3$/min)	Estimated Cutting Power PC (HP)	Expected Torque (lbf-ft)	Tool Life Ratio (%)
S	Titanium Alloy (Ti6Al4V)	ϕ2.0	3	LS	130	248	1.496	2.000	.004	2.932	9	8.6	182	40
			4	MS	165	315	1.969	1.200	.004	4.963	12	10.7	178	60
			4	MS	195	372	1.969	.800	.004	5.865	9	8.0	113	80
			4	HS	195	372	1.969	.400	.005	7.038	6	5.2	74	100
		ϕ2.5	5	LS	130	199	2.362	2.500	.004	3.910	23	22.3	590	40
			5	MS	165	252	2.362	1.500	.004	4.963	18	15.9	332	60
			5	MS	195	298	2.362	1.000	.004	5.865	14	12.0	212	80
			5	HS	195	298	2.362	.500	.005	7.038	8	7.8	137	100
		ϕ3.0	6	LS	130	166	2.953	3.000	.004	3.910	35	33.2	1055	40
			6	MS	165	210	2.953	1.800	.004	4.963	26	23.8	594	60
			6	MS	195	248	2.953	1.200	.004	5.865	21	17.9	379	80
			6	HS	195	248	2.953	.600	.005	7.038	12	11.6	246	100
	Titanium Alloy (Ti-5553)	ϕ2.0	3	LS	80	153	2.953	2.000	.003	1.444	9	8.5	292	30
			4	MS	80	153	2.953	1.200	.003	1.925	7	6.5	224	50
			4	MS	100	191	2.953	.800	.004	3.008	7	6.5	178	70
			4	HS	100	191	2.953	.400	.004	3.008	4	3.6	98	80
		ϕ2.5	5	LS	80	122	2.953	2.500	.003	1.925	14	14.1	608	30
			5	MS	80	122	2.953	1.500	.003	1.925	9	8.1	350	50
			5	MS	100	153	2.953	1.000	.004	3.008	9	8.1	278	70
			5	HS	100	153	2.953	.500	.004	3.008	4	4.5	154	80
		ϕ3.0	6	LS	80	102	3.543	3.000	.003	1.925	20	20.1	1035	30
			6	MS	80	102	3.543	1.800	.003	1.925	12	11.5	595	50
			6	MS	100	127	3.543	1.200	.004	3.008	13	11.5	474	70
			6	HS	100	127	3.543	.600	.004	3.008	6	6.3	262	80

VFX5 (Metric Standard)

(inch)

	Work Material	DC (inch)	Number of Flutes	Chip Breaker	vc (SFM)	n (min^{-1})	apmax	ae	fz (IPT)	vf (IPM)	Chip Removal Rate Q ($inch^3$/min)	Estimated Cutting Power PC (HP)	Expected Torque (lbf-ft)	Tool Life Ratio (%)
S	Titanium Alloy (Ti6Al4V)	ϕ40	3	LS	130	315	1.496	1.575	.004	3.724	9	8.6	143	40
			3	MS	165	400	1.496	.945	.004	4.727	7	6.1	80	60
			3	MS	195	473	1.496	.630	.004	5.586	5	4.6	51	80
			3	HS	195	473	1.496	.315	.005	6.704	3	3.0	33	100
		ϕ50	3	LS	130	252	1.496	1.969	.004	2.979	9	8.6	179	40
			4	MS	165	320	1.969	1.181	.004	5.042	12	10.7	175	60
			4	MS	195	378	1.969	.787	.004	5.959	9	8.0	112	80
			4	HS	195	378	1.969	.394	.005	7.151	6	5.2	72	100
		ϕ63	5	LS	130	200	2.362	2.480	.004	3.941	23	22.3	585	40
			5	MS	165	254	2.362	1.488	.004	5.002	18	15.9	329	60
			5	MS	195	300	2.362	.992	.004	5.911	14	12.0	210	80
			5	HS	195	300	2.362	.496	.005	7.094	8	7.8	136	100
		ϕ80	6	LS	130	158	2.953	3.150	.004	3.724	35	33.2	1107	40
			6	MS	165	200	2.953	1.890	.004	4.727	26	23.8	624	60
			6	MS	195	236	2.953	1.260	.004	5.586	21	17.9	398	80
			6	HS	195	236	2.953	.630	.005	6.704	12	11.6	258	100
	Titanium Alloy (Ti-5553)	ϕ40	3	LS	80	194	2.362	1.575	.003	1.833	7	6.8	185	30
			3	MS	80	194	2.362	.945	.003	1.833	4	3.9	106	50
			3	MS	100	243	2.362	.630	.004	2.865	4	3.9	85	70
			3	HS	100	243	2.362	.315	.004	2.865	2	2.2	47	80
		ϕ50	3	LS	80	155	2.953	1.969	.003	1.467	9	8.5	287	30
			4	MS	80	155	2.953	1.181	.003	1.956	7	6.5	220	50
			4	MS	100	194	2.953	.787	.004	3.056	7	6.5	175	70
			4	HS	100	194	2.953	.394	.004	3.056	4	3.6	97	80
		ϕ63	5	LS	80	123	2.953	2.480	.003	1.940	14	14.1	603	30
			5	MS	80	123	2.953	1.488	.003	1.940	9	8.1	347	50
			5	MS	100	154	2.953	.992	.004	3.032	9	8.1	276	70
			5	HS	100	154	2.953	.496	.004	3.032	4	4.5	153	80
		ϕ80	6	LS	80	97	3.543	3.150	.003	1.833	20	20.1	1086	30
			6	MS	80	97	3.543	1.890	.003	1.833	12	11.5	625	50
			6	MS	100	121	3.543	1.260	.004	2.865	13	11.5	498	70
			6	HS	100	121	3.543	.630	.004	2.865	6	6.3	275	80

(Note 1) Note that machining performance varies depending to the conditions such as machine rigidity, work clamping rigidity, coolant supply system, pressure and flow volume etc.

(Note 2) Internal coolant is recommended. To allow coolant through the tool, use a FMH coolant through type arbor. Using external coolant in combination with through coolant is even more effective.

(Note 3) The tool life ratio shows the standard when ae = tool diameter × 20% is assumed to be 100 when shoulder cutting.

(Note 4) The maximum depth of cut (apmax) varies according to the machine rigidity and power.

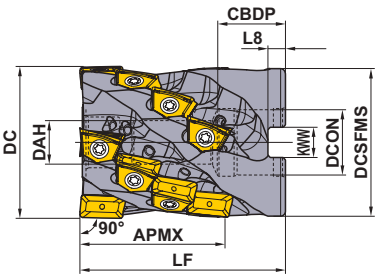
DEEP SHOULDER MILLING

Roughing

VFX6



- Vertical inserts with high strength cutting edge.
- Screw-on type clamping.
- High efficiency milling of titanium alloys.



Right hand tool holder only.

Shell Type

DC = Inch, DCON = Inch (inch)

Order Number	Stock R	* No.F	Total	DC	LF	DCON	CBDP	DAH	DCSFMS	KWW	L8	APMX	WT (lbs)
VFX6UR2504CA12	●	4	8	2.5	2.5	1.00	1.25	.520	2.421	.375	.219	1.2	.21
VFX6UR2504CA23	●	4	16	2.5	3.5	1.00	1.25	.520	2.421	.375	.219	2.3	.29
VFX6UR0305DA12	●	5	10	3.0	2.5	1.25	1.375	.645	2.894	.500	.281	1.2	.30
VFX6UR0305DA29	●	5	25	3.0	4.25	1.25	1.375	.645	2.894	.500	.281	2.9	.52
VFX6UR0406EA12	●	6	12	4.0	3.0	1.50	1.50	.770	3.866	.625	.375	1.2	.69
VFX6UR0406EA35	●	6	36	4.0	5.0	1.50	1.50	.770	3.866	.625	.375	3.5	1.16

* No. F = Number of Flutes

Spare Parts

Order Number	*2 Clamp Screw	Number	Seal Washer	Wrench	*3 Coolant Nozzle	Number	Anti-seize Lubricant	Set Bolt	Number of Insert: End Cutting Edge XNMU1909 ○○R-○○	Number of Insert: Peripheral *1 Cutting Edge XNMU1909 12R-○○
VFX6UR2504CA12	TS450	8	WU500-S1	TKY20T	HSD04004H08	12	MK1KS	HSCUF50018	4	4
VFX6UR2504CA23	TS450	16	WU500-S1	TKY20T	HSD04004H08	20	MK1KS	HSCUF50028	4	12
VFX6UR0305DA12	TS450	10	WU625-S1	TKY20T	HSD04004H08	15	MK1KS	HSCUF62518	5	5
VFX6UR0305DA29	TS450	25	WU625-S1	TKY20T	HSD04004H08	30	MK1KS	HSCUF62535	5	20
VFX6UR0406EA12	TS450	12	WU750-S1	TKY20T	HSD04004H08	18	MK1KS	HSCUF75018	6	6
VFX6UR0406EA35	TS450	36	WU750-S1	TKY20T	HSD04004H08	42	MK1KS	HSCUF75040	6	30

*1. Only corner radius RE.047" can be used.
*2. Clamp Torque (lbf-in) : TS450=44
*3. The .031" nozzels are installed in the standard. Select and use alternate nozzles from below list depending on coolant pressure.

	≤140PSI (≤5.3gal/min)	←Standard→ (140PSI-720PSI)	≥720PSI (≥7.9gal/min)	≥1000PSI (≥13.2gal/min)
Nozzle Dia.	ø.024"	ø.031"	ø.047"	ø.063"
Order Number	**HSD04004H06**	**HSD04004H08**	**HSD04004H12**	**HSD04004H16**

- Clamp Torque (lbf-in) : HSD0400H○○=13
- The part number for a plug screw without a through nozzle is HSS04004.
- Insert with a corner radius of .125" and above, as corner radius increases the LF dimension increases.
  Corner radius .125": LF+.028" Corner radius .157": LF+.059" Corner radius .197": LF+.059"

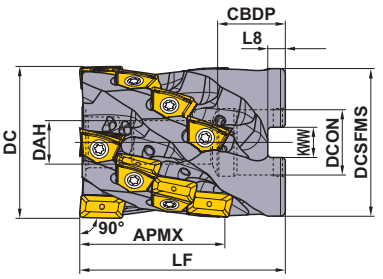
● : Inventory maintained. ★ : Inventory maintained in Japan.



Metric Standard

DC = mm, DCON = Inch

- **Vertical inserts with high strength cutting edge.**
- **Screw-on type clamping.**
- **High efficiency milling of titanium alloys.**



Right hand tool holder only.

Shell Type

(mm)

Order Number	Stock R	✶ No.F	Total	DC	LF	DCON	CBDP	DAH	DCSFMS	KWW	L8	APMX	WT(kg)
VFX6-063A04A031R	★	4	8	63	60	27	28	12.5	61	12.4	7	31	0.9
VFX6-063A04A060R	★	4	16	63	85	27	28	12.5	61	12.4	7	60	1.3
VFX6-080A05A031R	★	5	10	80	60	32	28	16.5	77.3	14.4	8	31	1.5
VFX6-080A05A075R	★	5	25	80	100	32	28	16.5	77.3	14.4	8	75	2.6
VFX6-100A06A031R	★	6	12	100	65	40	30	20.5	96.6	16.4	9	31	2.7
VFX6-100A06A090R	★	6	36	100	115	40	30	20.5	96.6	16.4	9	90	4.8

✶ No. F = Number of Flutes

Spare Parts

Order Number	✶2 Clamp Screw	Number	Seal Washer	Wrench	✶3 Coolant Nozzle	Number	Anti-seize Lubricant	Set Bolt	Number of Insert: End Cutting Edge XNMU1909 ○○R-○○	Number of Insert: Peripheral ✶1 Cutting Edge XNMU1909 12R-○○
VFX6-063A04A031R	TS450	8	W12-S1	TKY20T	HSD04004H08	12	MK1KS	HSC12045	4	4
VFX6-063A04A060R	TS450	16	W12-S1	TKY20T	HSD04004H08	20	MK1KS	HSC12070	4	12
VFX6-080A05A031R	TS450	10	W16-S1	TKY20T	HSD04004H08	15	MK1KS	HSC16040	5	5
VFX6-080A05A075R	TS450	25	W16-S1	TKY20T	HSD04004H08	30	MK1KS	HSC16080	5	20
VFX6-100A06A031R	TS450	12	W20-S1	TKY20T	HSD04004H08	18	MK1KS	HSC20040	6	6
VFX6-100A06A090R	TS450	36	W20-S1	TKY20T	HSD04004H08	42	MK1KS	HSC20090	6	30

✶1 Only corner radius RE1.2 can be used for the peripheral cutting edges except the end cutting edge.

✶2 Clamp Torque (N • m) : TS450=5.0

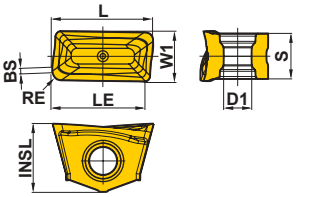
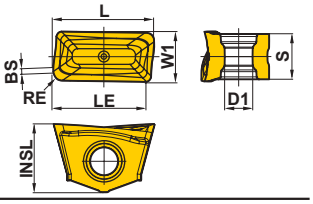
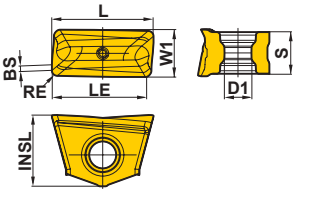
✶3 Coolant nozzles are available with varying diameters for adjusting coolant pressure. Select nozzles as required by the specification.

	≤1Mpa (≤20 l/min.)	←Standard→	≥5Mpa (≥30 l/min.)	≥7Mpa (≥50 l/min.)
Nozzle Dia.	ø0.6mm	ø0.8mm	ø1.2mm	ø1.6mm
Order Number	**HSD04004H06**	**HSD04004H08**	**HSD04004H12**	**HSD04004H16**

- Clamp Torque (N • m) : HSD0400H○○=1.5
- The part number for a plug screw without a through nozzle is HSS04004.
- Insert with a corner radius of 3.2mm and above, as corner radius increases the LF dimension increases.
  Corner radius 3.2mm: LF+0.7mm Corner radius 4.0mm: LF+1.5mm Corner radius 5.0mm: LF+1.5mm

Inserts

(inch)

Shape	Order Number	Stock Coated MP9030	Stock Coated MP9130			L	LE	W1	INSL	S	BS	RE	D1	Geometry
	XNMU190912R-MS	●	●			.752	.650	.374	.500	.335	.039	.047	.205	
	XNMU190916R-MS	●	●			.752	.650	.374	.500	.335	.039	.063	.205	
	XNMU190924R-MS	●	●			.752	.654	.374	.500	.335	.039	.094	.205	
	∗1 XNMU190932R-MS	●	●			.795	.673	.374	.500	.335	—	.126	.205	
	∗1 XNMU190940R-MS	●	●			.858	.701	.374	.500	.335	—	.157	.205	
	∗1 XNMU190950R-MS	●	●			.858	.701	.374	.500	.335	—	.197	.205	
	XNMU190912R-HS	●	●			.752	.650	.374	.500	.335	.039	.047	.205	
	XNMU190912R-LS		●			.752	.650	.374	.500	.335	.039	.047	.205	

∗1 Note for insert with a corner radius of .125" and above, as corner radius increases the LF dimension increases.
Corner radius .125": LF+.028" Corner radius .157": LF+.059" Corner radius .197": LF+.059"

● : Inventory maintained. (10 insert in one case)

Recommended Cutting Conditions

VFX6

(inch)

	Work Material	DC (inch)	Number of Flutes	Chip Breaker	vc (SFM)	n (min^{-1})	apmax	ae	fz (IPT)	vf (IPM)	Chip Removal Rate Q (inch^3/min)	Estimated Cutting Power PC (HP)	Expected Torque (lbf-ft)	Tool Life Ratio (%)
S	Titanium Alloy (Ti6Al4V)	ϕ2.5	4	LS	130	199	2.362	2.500	.004	3.128	18	17.8	472	40
			4	MS	165	252	2.362	1.500	.004	3.970	14	12.7	266	60
			4	MS	195	298	2.362	1.000	.004	4.692	11	9.6	170	80
			4	HS	195	298	2.362	.500	.005	5.630	7	6.2	110	100
		ϕ3.0	5	LS	130	166	2.953	3.000	.004	3.258	29	27.7	879	40
			5	MS	165	210	2.953	1.800	.004	4.136	22	19.8	495	60
			5	MS	195	248	2.953	1.200	.004	4.887	17	14.9	316	80
			5	HS	195	248	2.953	.600	.005	5.865	10	9.7	205	100
		ϕ4.0	6	LS	130	124	3.543	4.000	.004	2.932	42	39.3	1663	40
			6	MS	165	158	3.543	2.400	.004	3.722	32	28.1	937	60
			6	MS	195	186	3.543	1.600	.004	4.399	25	21.2	599	80
			6	HS	195	186	3.543	.800	.005	5.278	15	13.8	388	100
	Titanium Alloy (Ti-5553)	ϕ2.5	4	LS	80	122	2.362	2.500	.003	1.540	9	9.1	392	30
			4	MS	80	122	2.362	1.500	.003	1.540	5	5.2	225	50
			4	MS	100	153	2.362	1.000	.004	2.406	6	5.2	179	70
			4	HS	100	153	2.362	.500	.004	2.406	3	2.9	99	80
		ϕ3.0	5	LS	80	102	2.953	3.000	.003	1.604	14	14.1	730	30
			5	MS	80	102	2.953	1.800	.003	1.604	9	8.1	419	50
			5	MS	100	127	2.953	1.200	.004	2.506	9	8.1	334	70
			5	HS	100	127	2.953	.600	.004	2.506	4	4.5	185	80
		ϕ4.0	6	LS	80	76	3.543	4.000	.003	1.444	20	20.1	1380	30
			6	MS	80	76	3.543	2.400	.003	1.444	12	11.5	794	50
			6	MS	100	95	3.543	1.600	.004	2.256	13	11.5	632	70
			6	HS	100	95	3.543	.800	.004	2.256	6	6.3	349	80

VFX6 (Metric Standard)

(inch)

	Work Material	DC (inch)	Number of Flutes	Chip Breaker	vc (SFM)	n (min^{-1})	apmax	ae	fz (IPT)	vf (IPM)	Chip Removal Rate Q (inch^3/min)	Estimated Cutting Power PC (HP)	Expected Torque (lbf-ft)	Tool Life Ratio (%)
S	Titanium Alloy (Ti6Al4V)	ϕ63	4	LS	130	200	2.362	2.480	.004	3.153	18	17.8	468	40
			4	MS	165	254	2.362	1.488	.004	4.002	14	12.7	263	60
			4	MS	195	300	2.362	.992	.004	4.729	11	9.6	168	80
			4	HS	195	300	2.362	.496	.005	5.675	7	6.2	109	100
		ϕ80	5	LS	130	158	2.953	3.150	.004	3.104	29	27.7	923	40
			5	MS	165	200	2.953	1.890	.004	3.939	22	19.8	520	60
			5	MS	195	236	2.953	1.260	.004	4.655	17	14.9	332	80
			5	HS	195	236	2.953	.630	.005	5.586	10	9.7	215	100
		ϕ100	6	LS	130	126	3.543	3.937	.004	2.979	42	39.3	1637	40
			6	MS	165	160	3.543	2.362	.004	3.782	32	28.1	923	60
			6	MS	195	189	3.543	1.575	.004	4.469	25	21.2	590	80
			6	HS	195	189	3.543	.787	.005	5.363	15	13.8	382	100
	Titanium Alloy (Ti-5553)	ϕ63	4	LS	80	123	2.362	2.480	.003	1.552	9	9.1	389	30
			4	MS	80	123	2.362	1.488	.003	1.552	5	5.2	223	50
			4	MS	100	154	2.362	.992	.004	2.425	6	5.2	178	70
			4	HS	100	154	2.362	.496	.004	2.425	3	2.9	98	80
		ϕ80	5	LS	80	97	2.953	3.150	.003	1.528	14	14.1	766	30
			5	MS	80	97	2.953	1.890	.003	1.528	9	8.1	440	50
			5	MS	100	121	2.953	1.260	.004	2.387	9	8.1	350	70
			5	HS	100	121	2.953	.630	.004	2.387	4	4.5	194	80
		ϕ100	6	LS	80	78	3.543	3.937	.003	1.467	20	20.1	1358	30
			6	MS	80	78	3.543	2.362	.003	1.467	12	11.5	781	50
			6	MS	100	97	3.543	1.575	.004	2.292	13	11.5	622	70
			6	HS	100	97	3.543	.787	.004	2.292	6	6.3	344	80

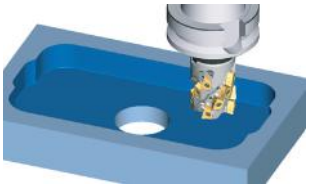
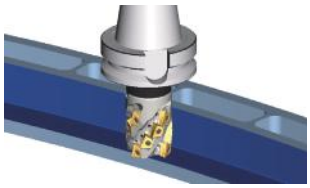
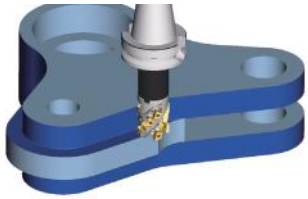
(Note 1) Note that machining performance varies depending to the conditions such as machine rigidity, work clamping rigidity, coolant supply system, pressure and flow volume etc.

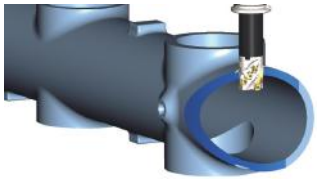
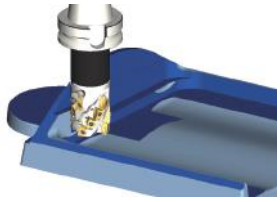
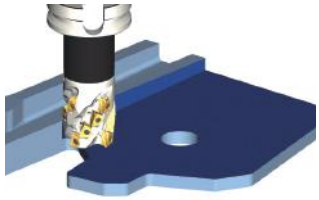
(Note 2) Internal coolant is recommended. To allow coolant through the tool, use a FMH coolant through type arbor. Using external coolant in combination with through coolant is even more effective.

(Note 3) The tool life ratio shows the standard when ae = tool diameter × 20% is assumed to be 100 when shoulder cutting.

(Note 4) The maximum depth of cut (apmax) varies according to the machine rigidity and power.

Application Examples

	Tool	VFX5-050A04A050R	VFX5-050A04A050R	VFX5-050A04A050R
	Workpiece	Titanium Alloy (Ti6Al4V) 	Titanium Alloy (Ti6Al4V) 	Titanium Alloy (Ti6Al4V) 
	Component	Aerospace Parts	Aerospace Parts	Aerospace Parts
Cutting Conditions	Cutting Speed (SFM)	130	165	180
	Table Feed (IPM)	4.0	5.0	5.5
	Feed per Tooth (IPT)	.004	.004	.004
	Width of Cut **ae** (inch)	.197-1.181	.394	.591
	Depth of Cut **ap** (inch)	.197-2.362	1.969	1.378
	Cutting Mode	Wet Cutting (Internal:435PSI)	Wet Cutting (External:220PSI)	Wet Cutting (External:435PSI)
	Results	Efficiency was increased by a factor of 1.3.	Efficiency increased by a factor of 1.5 and was also possible to achieve stable machining of thin walled parts.	It was possible to use 2 times increased cutting conditions for greater cost reduction.

	Tool	VFX6-080A05A075R	VFX6-063A04A060R	VFX6-063A04A060R
	Workpiece	Titanium Alloy (Ti-5553) 	Titanium Alloy (Ti6Al4V) 	Titanium Alloy (Ti6Al4V) 
	Component	Aerospace Parts	Aerospace Parts	Aerospace Parts
Cutting Conditions	Cutting Speed (SFM)	105	180	145
	Table Feed (IPM)	1.0	10.9	8.9
	Feed per Tooth (IPT)	.002	.005	.002
	Width of Cut **ae** (inch)	.394-1.181	.394-1.772	.197-.945
	Depth of Cut **ap** (inch)	1.181-2.362	.984-2.362	.472-1.457
	Cutting Mode	Wet Cutting (Internal:1015PSI)	Wet Cutting (Internal:1450PSI)	Wet Cutting (External:220PSI)
	Results	With the same tool life (190 mins) as conventional tools, it was possible to use 1.2 times increased cutting conditions for greater efficiency.	At a metal removal rate of 4.7inch^3 /min, tool life was constant at 60mins and efficiency increased x 1.5. VFX was stable in tests at a max. metal removal rate of 24inch^3 /min.	Three times tool life at cutting conditions improved by a factor of 2.7. Total cost reductions of 62%.

●With reference to the above examples, adjust the cutting conditions according to the machine specifications, workpiece geometry and clamping method used.

Memo

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FOR YOUR SAFETY

- Don't handle inserts and chips without gloves.
- Please machine within the recommended application range and exchange expired tools with new ones in advance of breakage.
- Please use safety covers and wear safety glasses.
- When using compounded cutting oils, please take fire precautions.
- When attaching inserts or spare parts, please use only the correct wrench or driver.
- When using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc.

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Tools specifications subject to change without notice.

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