OPTIMUM GRADES AND CHIP BREAKERS FOR EXTERNAL TURNING

●Selection of optimum inserts for turning

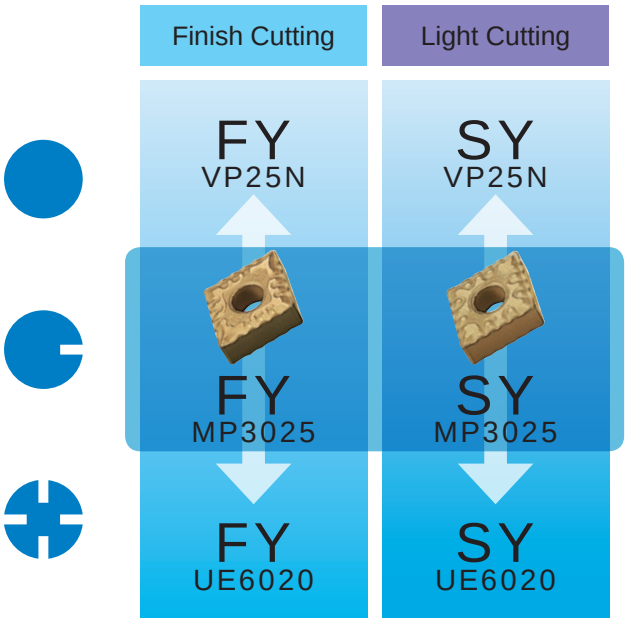
The following diagrams show for each type of work material, the optimal combination of suitable grades and chip breakers for each application area in turning.

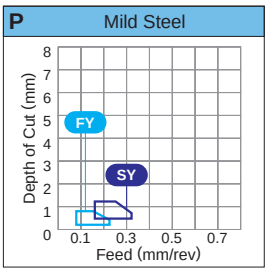
■CUTTING CONDITIONS

Stable Cutting	Continuous Cutting Constant Depth of Cut Pre-Machined Securely Clamped Component Cutting
General Cutting	
Unstable Cutting	Heavy Interrupted Cutting Irregular Depth of Cut Low Clamping Rigidity Cutting

■CUTTING AREA

- F Finish Cutting
- L Light Cutting
- M Medium Cutting
- R Rough Cutting
- H Heavy Cutting



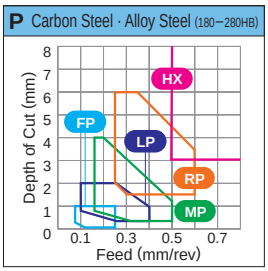


P Mild Steel (Ex : SS400, S10C)

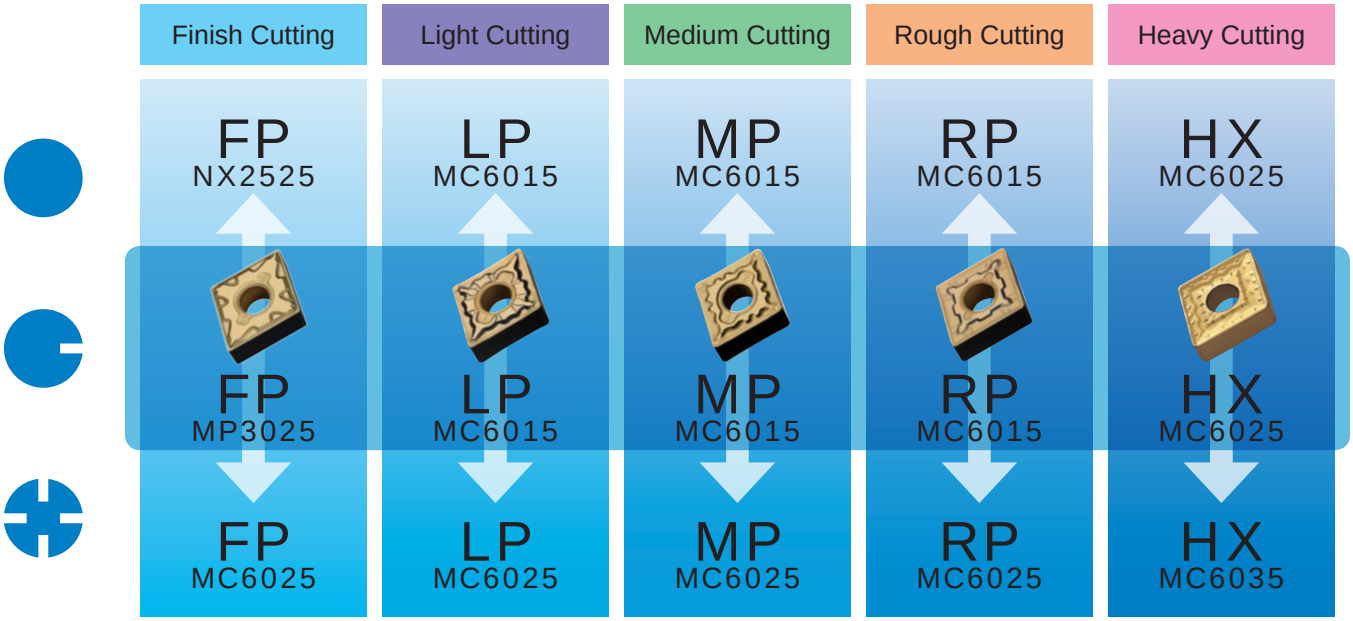
NEGATIVE INSERTS

vc : Cutting Speed
f : Feed
ap : Depth of Cut

	Cutting Area	Chip Breaker	Grade	1st Recommendation vc (m/min)	f (mm/rev)	ap (mm)
Stable Cutting	F	FY	VP25N	285—450	0.09—0.23	0.20—0.80
	L	SY	VP25N	260—410	0.16—0.33	0.50—1.20
General Cutting	F	FY	MP3025	275—425	0.09—0.23	0.20—0.80
	L	SY	MP3025	255—385	0.16—0.33	0.50—1.20
Unstable Cutting	F	FY	UE6020	285—465	0.09—0.23	0.20—0.80
	L	SY	UE6020	260—425	0.16—0.33	0.50—1.20



Stable Cutting	F Finish Cutting
General Cutting	L Light Cutting
Unstable Cutting	M Medium Cutting
	R Rough Cutting
	H Heavy Cutting

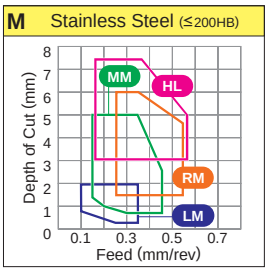


P Carbon Steel • Alloy Steel (Ex : S45C, SCM440)

NEGATIVE INSERTS

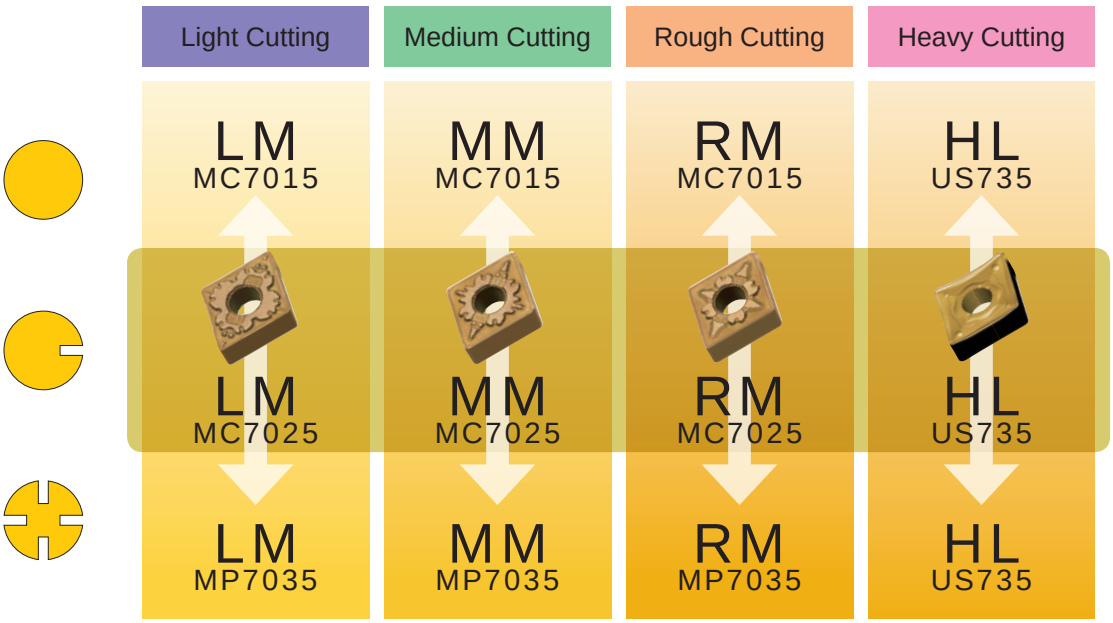
vc : Cutting Speed
f : Feed
ap : Depth of Cut

	Cutting Area	Chip Breaker	1st Recommendation Grade	vc (m/min)	f (mm/rev)	ap (mm)
Stable Cutting	F	FP	NX2525	210–300	0.08–0.25	0.10–1.00
	L	LP	MC6015	210–360	0.10–0.40	0.30–2.00
	M	MP	MC6015	195–330	0.16–0.50	0.30–4.00
	R	RP	MC6015	185–310	0.25–0.60	1.50–6.00
	H	HX	MC6025	165–265	0.50–1.26	3.00–11.00
General Cutting	F	FP	MP3025	215–330	0.08–0.25	0.10–1.00
	L	LP	MC6015	210–360	0.10–0.40	0.30–2.00
	M	MP	MC6015	195–330	0.16–0.50	0.30–4.00
	R	RP	MC6015	185–310	0.25–0.60	1.50–6.00
	H	HX	MC6025	165–265	0.50–1.26	3.00–11.00
Unstable Cutting	F	FP	MC6025	230–375	0.08–0.25	0.10–1.00
	L	LP	MC6025	210–345	0.10–0.40	0.30–2.00
	M	MP	MC6025	195–315	0.16–0.50	0.30–4.00
	R	RP	MC6025	185–295	0.25–0.60	1.50–6.00
	H	HX	MC6035	140–200	0.50–1.26	3.00–11.00



Stable Cutting
General Cutting
Unstable Cutting

L Light Cutting
M Medium Cutting
R Rough Cutting

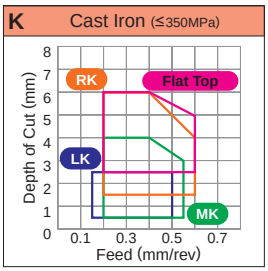


M Stainless Steel (Ex : SUS304, SUS316)

NEGATIVE INSERTS

vc : Cutting Speed
f : Feed
ap : Depth of Cut

	Cutting Area	Chip Breaker	1st Recommendation Grade	vc (m/min)	f (mm/rev)	ap (mm)
Stable Cutting	L	LM	MC7015	180–285	0.10–0.30	0.30–2.00
	M	MM	MC7015	160–260	0.15–0.45	0.70–5.00
	R	RM	MC7015	155–245	0.25–0.55	1.50–6.00
	H	HL	US735	75–140	0.40–1.00	1.50–8.00
General Cutting	L	LM	MC7025	165–220	0.10–0.30	0.30–2.00
	M	MM	MC7025	150–200	0.15–0.45	0.70–5.00
	R	RM	MC7025	140–190	0.25–0.55	1.50–6.00
	H	HL	US735	75–140	0.40–1.00	1.50–8.00
Unstable Cutting	L	LM	MP7035	95–155	0.10–0.30	0.30–2.00
	M	MM	MP7035	90–145	0.15–0.45	0.70–5.00
	R	RM	MP7035	85–135	0.25–0.55	1.50–6.00
	H	HL	US735	75–140	0.40–1.00	1.50–8.00



Stable Cutting
General Cutting
Unstable Cutting

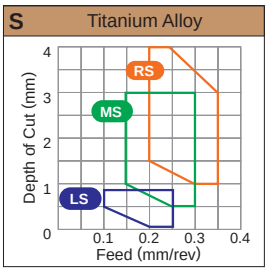
L Light Cutting
M Medium Cutting
R Rough Cutting
H Heavy Cutting

K Cast Iron • Ductile Cast Iron (Ex : FC300)

NEGATIVE INSERTS

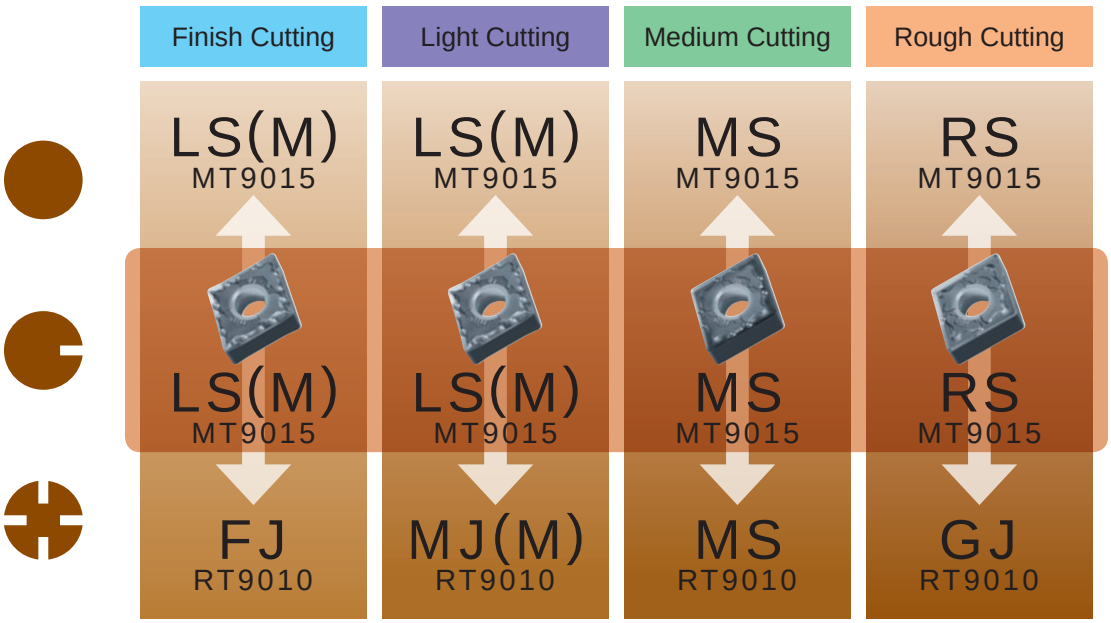
vc : Cutting Speed
f : Feed
ap : Depth of Cut

	Cutting Area	1st Recommendation				
		Chip Breaker	Grade	vc (m/min)	f (mm/rev)	ap (mm)
Stable Cutting	L	LK	MC5005	230—365	0.10—0.40	0.30—2.00
	M	MK	MC5005	210—335	0.20—0.55	1.00—4.00
	R	RK	MC5005	195—315	0.25—0.60	1.50—6.00
	H	Flat Top	MC5005	195—315	0.20—0.60	2.50—6.00
General Cutting	L	LK	MC5015	205—335	0.10—0.40	0.30—2.00
	M	MK	MC5015	190—305	0.20—0.55	1.00—4.00
	R	RK	MC5015	180—285	0.25—0.60	1.50—6.00
	H	Flat Top	MC5015	180—285	0.20—0.60	2.50—6.00
Unstable Cutting	L	LK	MC5015	205—335	0.10—0.40	0.30—2.00
	M	MK	MC5015	190—305	0.20—0.55	1.00—4.00
	R	RK	MC5015	180—285	0.25—0.60	1.50—6.00
	H	Flat Top	MC5015	180—285	0.20—0.60	2.50—6.00



- Stable Cutting
- General Cutting
- Unstable Cutting

- F Finish Cutting
- L Light Cutting
- M Medium Cutting
- R Rough Cutting

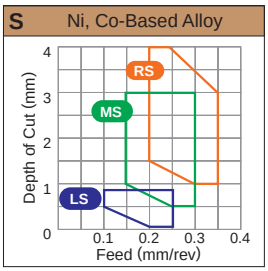


S Titanium Alloy (Ex : Ti-6Al-4V)

NEGATIVE INSERTS

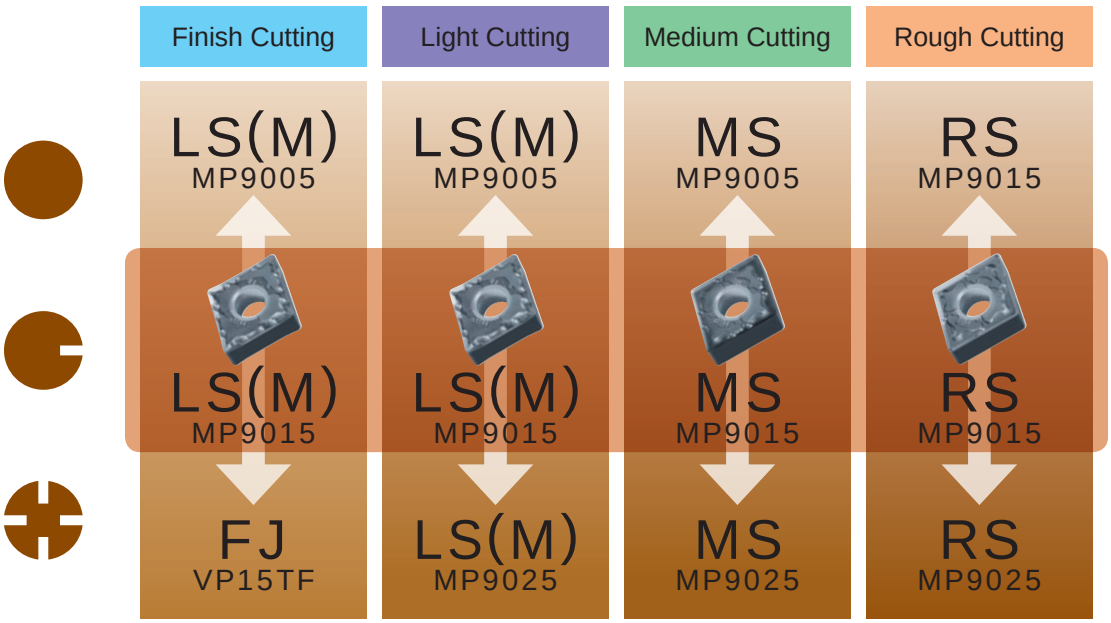
vc : Cutting Speed
f : Feed
ap : Depth of Cut

	Cutting Area	Chip Breaker	1st Recommendation Grade	vc (m/min)	f (mm/rev)	ap (mm)
Stable Cutting	F	LS(M)	MT9015	40–85	0.10–0.25	0.20–0.80
	L	LS(M)	MT9015	40–85	0.10–0.25	0.20–0.80
	M	MS	MT9015	40–80	0.10–0.25	0.50–4.00
	R	RS	MT9015	35–75	0.20–0.35	1.00–4.00
General Cutting	F	LS(M)	MT9015	40–85	0.10–0.25	0.20–0.80
	L	LS(M)	MT9015	40–85	0.10–0.25	0.20–0.80
	M	MS	MT9015	40–80	0.10–0.25	0.50–4.00
	R	RS	MT9015	35–75	0.20–0.35	1.00–4.00
Unstable Cutting	F	FJ	RT9010	45–95	0.07–0.20	0.10–1.00
	L	MJ(M)	RT9010	40–85	0.07–0.25	0.40–1.50
	M	MS	RT9010	40–80	0.10–0.25	0.50–4.00
	R	GJ	RT9010	35–75	0.16–0.35	1.00–3.00



- Stable Cutting
- General Cutting
- Unstable Cutting

- F Finish Cutting
- L Light Cutting
- M Medium Cutting
- R Rough Cutting

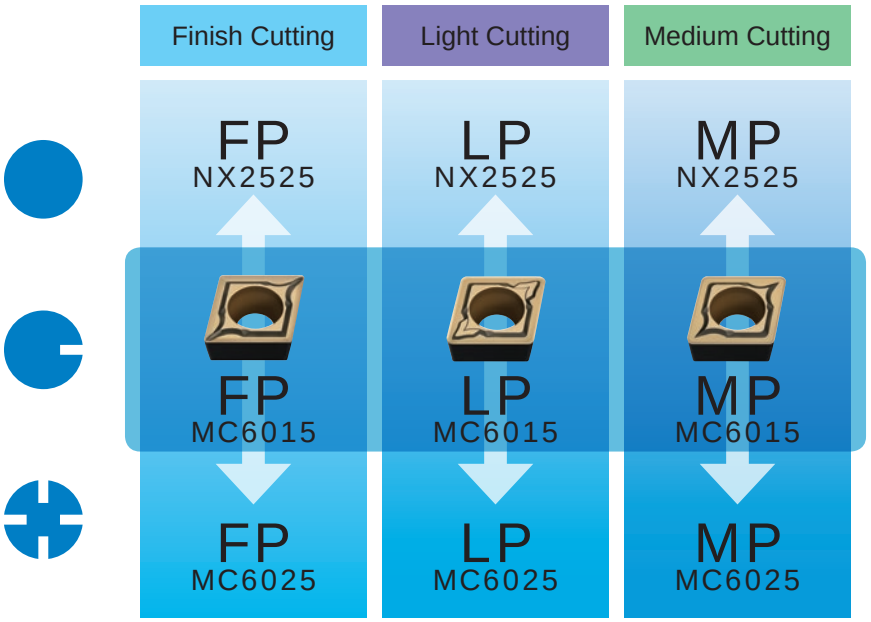


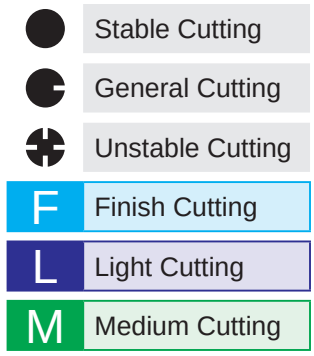
S Ni, Co-Based Alloy (Ex : Inconel718)

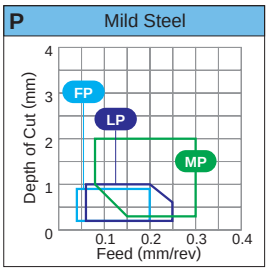
NEGATIVE INSERTS

vc : Cutting Speed
f : Feed
ap : Depth of Cut

	Cutting Area	1st Recommendation				
		Chip Breaker	Grade	vc (m/min)	f (mm/rev)	ap (mm)
Stable Cutting	F	LS(M)	MP9005	30—110	0.10—0.25	0.20—0.80
	L	LS(M)	MP9005	30—110	0.10—0.25	0.20—0.80
	M	MS	MP9005	30—100	0.10—0.25	0.50—4.00
	R	RS	MP9015	20—75	0.20—0.35	1.00—4.00
General Cutting	F	LS(M)	MP9015	25—85	0.10—0.25	0.20—0.80
	L	LS(M)	MP9015	25—85	0.10—0.25	0.20—0.80
	M	MS	MP9015	25—80	0.10—0.25	0.50—4.00
	R	RS	MP9015	20—75	0.20—0.35	1.00—4.00
Unstable Cutting	F	FJ	VP15TF	20—40	0.07—0.20	0.10—1.00
	L	LS(M)	MP9025	20—30	0.10—0.25	0.20—0.80
	M	MS	MP9025	20—30	0.10—0.25	0.50—4.00
	R	RS	MP9025	15—25	0.20—0.35	1.00—4.00





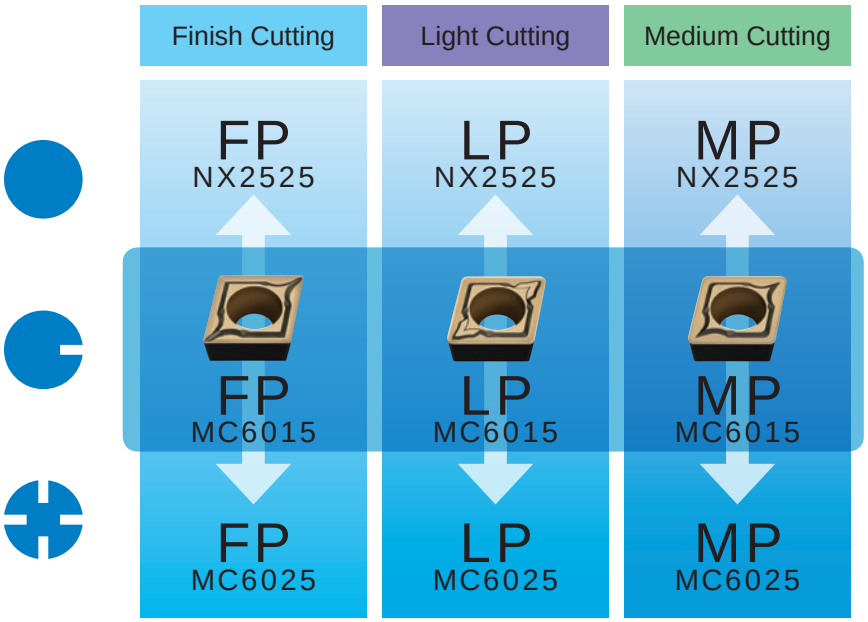


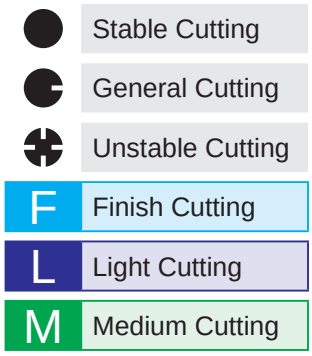
P Mild Steel (Ex : SS400, S10C)

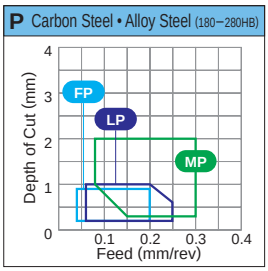
7°POSITIVE INSERTS WITH HOLE

vc : Cutting Speed
f : Feed
ap : Depth of Cut

	Cutting Area	Chip Breaker	Grade	1st Recommendation vc (m/min)	f (mm/rev)	ap (mm)
Stable Cutting	F	FP	NX2525	225–320	0.04–0.20	0.20–0.90
	L	LP	NX2525	225–320	0.06–0.25	0.20–1.00
	M	MP	NX2525	185–270	0.08–0.30	0.30–2.00
General Cutting	F	FP	MC6015	250–425	0.04–0.20	0.20–0.90
	L	LP	MC6015	250–425	0.06–0.25	0.20–1.00
	M	MP	MC6015	210–355	0.08–0.30	0.30–2.00
Unstable Cutting	F	FP	MC6025	250–405	0.04–0.20	0.20–0.90
	L	LP	MC6025	250–405	0.06–0.25	0.20–1.00
	M	MP	MC6025	210–340	0.08–0.30	0.30–2.00





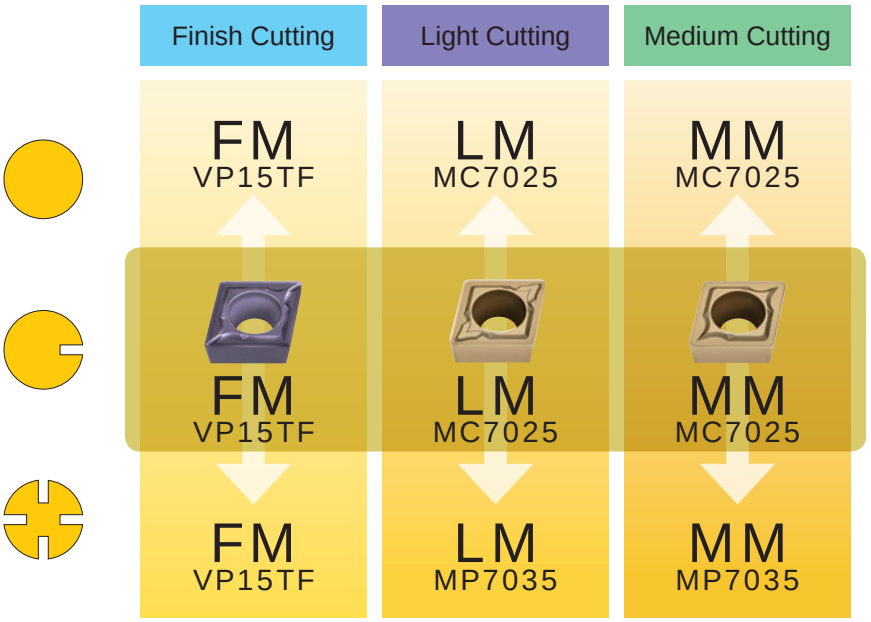


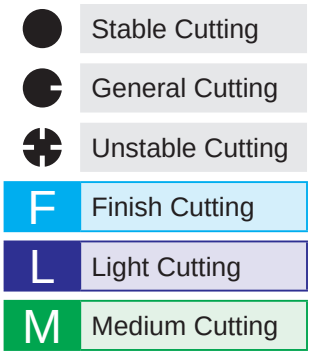
P Carbon Steel • Alloy Steel (Ex : S45C, SCM440)

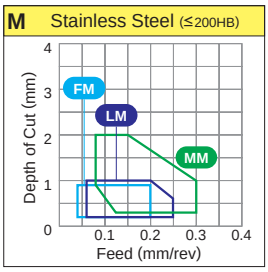
7°POSITIVE INSERTS WITH HOLE

vc : Cutting Speed
f : Feed
ap : Depth of Cut

	Cutting Area	Chip Breaker	1st Recommendation Grade	vc (m/min)	f (mm/rev)	ap (mm)
Stable Cutting	F	FP	NX2525	165–240	0.04–0.20	0.20–0.90
	L	LP	NX2525	165–240	0.06–0.25	0.20–1.00
	M	MP	NX2525	140–200	0.08–0.30	0.30–2.00
General Cutting	F	FP	MC6015	185–315	0.04–0.20	0.20–0.90
	L	LP	MC6015	185–315	0.06–0.25	0.20–1.00
	M	MP	MC6015	155–260	0.08–0.30	0.30–2.00
Unstable Cutting	F	FP	MC6025	185–300	0.04–0.20	0.20–0.90
	L	LP	MC6025	185–300	0.06–0.25	0.20–1.00
	M	MP	MC6025	155–250	0.08–0.30	0.30–2.00





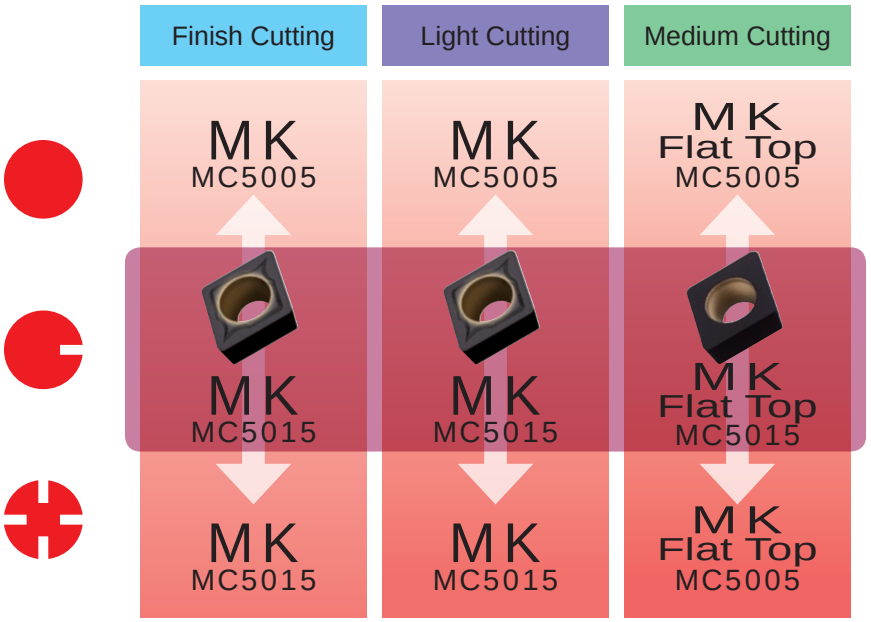


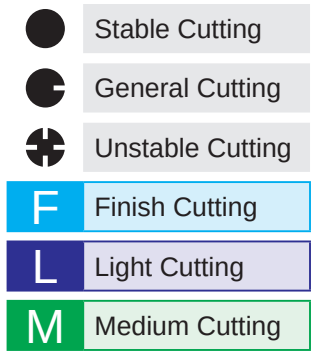
M Stainless Steel (Ex : SUS304, SUS316)

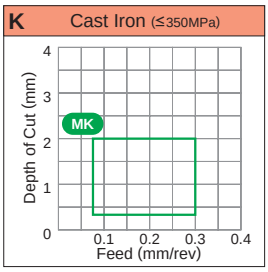
7°POSITIVE INSERTS WITH HOLE

vc : Cutting Speed
f : Feed
ap : Depth of Cut

	Cutting Area	Chip Breaker	Grade	1st Recommendation vc (m/min)	f (mm/rev)	ap (mm)
Stable Cutting	F	FM	VP15TF	75—125	0.04—0.20	0.20—0.90
	L	LM	MC7025	140—190	0.06—0.25	0.20—1.00
	M	MM	MC7025	120—160	0.08—0.30	0.30—2.00
General Cutting	F	FM	VP15TF	75—125	0.04—0.20	0.20—0.90
	L	LM	MC7025	140—190	0.06—0.25	0.20—1.00
	M	MM	MC7025	120—160	0.08—0.30	0.30—2.00
Unstable Cutting	F	FM	VP15TF	75—125	0.04—0.20	0.20—0.90
	L	LM	MP7035	85—135	0.06—0.25	0.20—1.00
	M	MM	MP7035	70—115	0.08—0.30	0.30—2.00





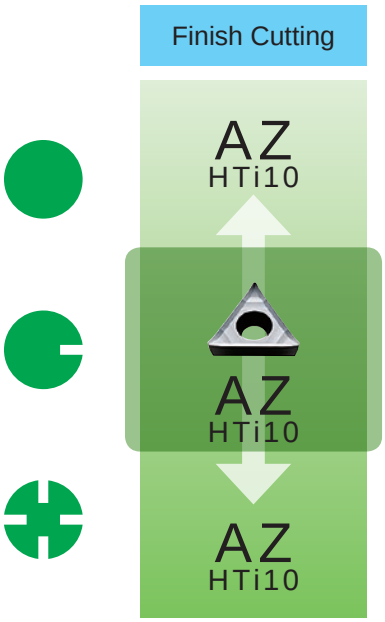


K Cast Iron • Ductile Cast Iron (Ex : FC300)

7°POSITIVE INSERTS WITH HOLE

vc : Cutting Speed
f : Feed
ap : Depth of Cut

	Cutting Area	Chip Breaker	Grade	1st Recommendation vc (m/min)	f (mm/rev)	ap (mm)
Stable Cutting	F	MK	MC5005	165–265	0.08–0.30	0.30–2.00
	L	MK	MC5005	165–265	0.08–0.30	0.30–2.00
	M	MK, Flat Top	MC5005	165–265	0.08–0.30	0.30–2.00
General Cutting	F	MK	MC5015	150–240	0.08–0.30	0.30–2.00
	L	MK	MC5015	150–240	0.08–0.30	0.30–2.00
	M	MK, Flat Top	MC5015	150–240	0.08–0.30	0.30–2.00
Unstable Cutting	F	MK	MC5015	150–240	0.08–0.30	0.30–2.00
	L	MK	MC5015	150–240	0.08–0.30	0.30–2.00
	M	MK, Flat Top	MC5015	150–240	0.08–0.30	0.30–2.00



Stable Cutting

General Cutting

Unstable Cutting

F Finish Cutting

N Aluminium Alloy (Ex : A6061, A7075)

7°POSITIVE INSERTS WITH HOLE

vc : Cutting Speed
f : Feed
ap : Depth of Cut

	Cutting Area	Chip Breaker	Grade	1st Recommendation vc (m/min)	f (mm/rev)	ap (mm)
Stable Cutting	F	AZ	HTi10	300—700	0.10—0.40	0.20—3.00
General Cutting	F	AZ	HTi10	300—700	0.10—0.40	0.20—3.00
Unstable Cutting	F	AZ	HTi10	300—700	0.10—0.40	0.20—3.00

Stable Cutting

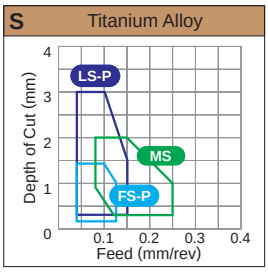
General Cutting

Unstable Cutting

F Finish Cutting

L Light Cutting

M Medium Cutting

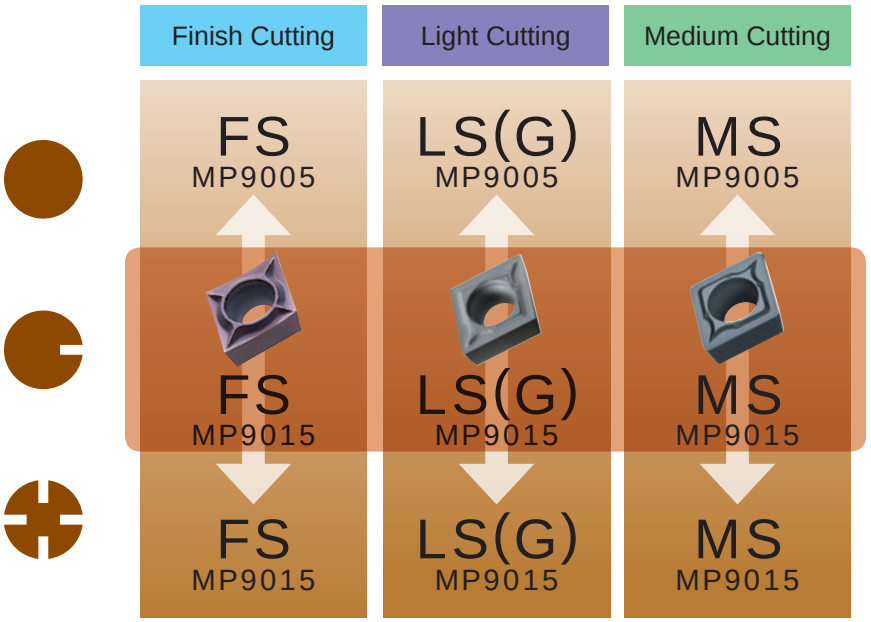


S Titanium Alloy (Ex : Ti-6Al-4V)

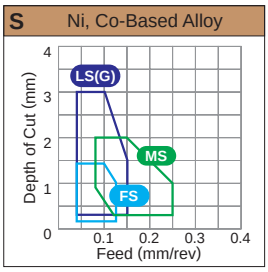
7°POSITIVE INSERTS WITH HOLE

vc : Cutting Speed
f : Feed
ap : Depth of Cut

	Cutting Area	Chip Breaker	Grade	1st Recommendation vc (m/min)	f (mm/rev)	ap (mm)
Stable Cutting	F	FS-P	MT9005	40—80	0.04—0.12	0.20—1.40
	L	LS-P	MT9005	40—80	0.04—0.15	0.30—3.00
	M	MS	MT9005	35—65	0.08—0.25	0.30—2.00
General Cutting	F	FS-P	MT9005	40—80	0.04—0.12	0.20—1.40
	L	LS-P	MT9005	40—80	0.04—0.15	0.30—3.00
	M	MS	MT9005	35—65	0.08—0.25	0.30—2.00
Unstable Cutting	F	FS-P	MT9005	40—80	0.04—0.12	0.20—1.40
	L	LS-P	MT9005	40—80	0.04—0.15	0.30—3.00
	M	MS	MT9005	35—65	0.08—0.25	0.30—2.00



Stable Cutting
General Cutting
Unstable Cutting
F Finish Cutting
L Light Cutting
M Medium Cutting



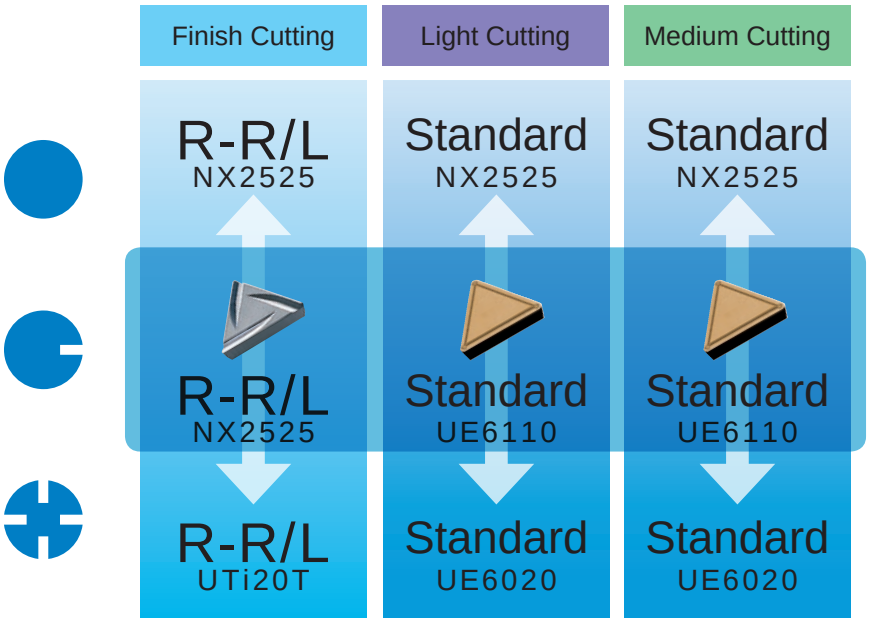
S Ni, Co-Based Alloy (Ex : Inconel718)

7°POSITIVE INSERTS WITH HOLE

vc : Cutting Speed
f : Feed
ap : Depth of Cut

	Cutting Area	Chip Breaker	1st Recommendation Grade	vc (m/min)	f (mm/rev)	ap (mm)
Stable Cutting	F	FS	MP9005	25−95	0.04−0.12	0.20−1.40
	L	LS(G)	MP9005	25−95	0.04−0.15	0.30−3.00
	M	MS	MP9005	20−80	0.08−0.25	0.30−2.00
General Cutting	F	FS	MP9015	20−75	0.04−0.12	0.20−1.40
	L	LS(G)	MP9015	20−75	0.04−0.15	0.30−3.00
	M	MS	MP9015	20−60	0.08−0.25	0.30−2.00
Unstable Cutting	F	FS	MP9015	20−75	0.04−0.12	0.20−1.40
	L	LS(G)	MP9015	20−75	0.04−0.15	0.30−3.00
	M	MS	MP9015	20−60	0.08−0.25	0.30−2.00

* The G class is recommended for the above FS/LS breaker



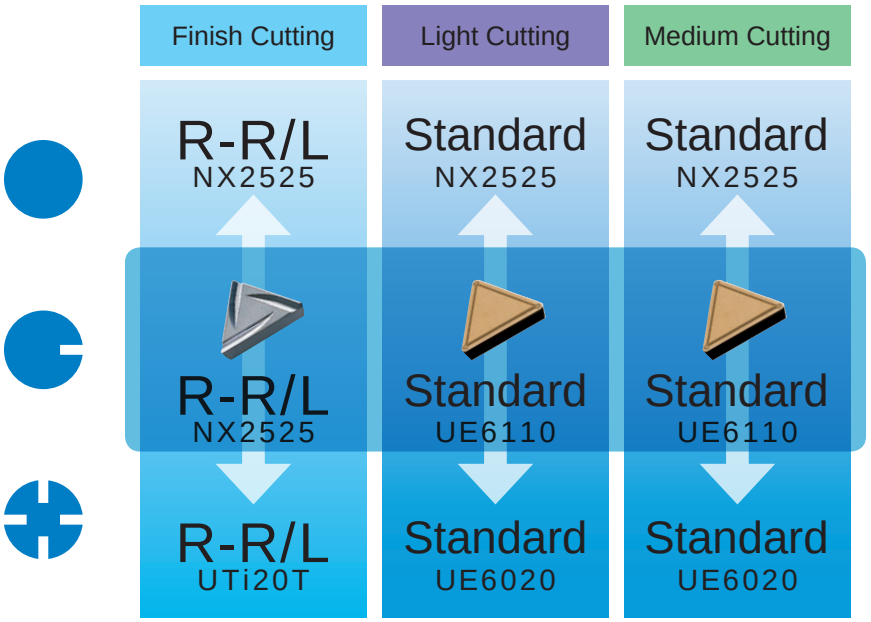
Stable Cutting
General Cutting
Unstable Cutting
F Finish Cutting
L Light Cutting
M Medium Cutting

P Mild Steel (Ex : SS400, S10C)

11°POSITIVE INSERTS WITHOUT HOLE

vc : Cutting Speed
f : Feed
ap : Depth of Cut

	Cutting Area	1st Recommendation				
		Chip Breaker	Grade	vc (m/min)	f (mm/rev)	ap (mm)
Stable Cutting	F	R-R/L	NX2525	225—320	0.05—0.12	0.20—0.60
	L	Standard	NX2525	185—270	0.08—0.30	0.30—2.00
	M	Standard	NX2525	185—270	0.08—0.30	0.30—2.00
General Cutting	F	R-R/L	NX2525	225—320	0.05—0.12	0.20—0.60
	L	Standard	UE6110	210—355	0.08—0.30	0.30—2.00
	M	Standard	UE6110	210—355	0.08—0.30	0.30—2.00
Unstable Cutting	F	R-R/L	UTi20T	115—165	0.05—0.12	0.20—0.60
	L	Standard	UE6020	195—320	0.08—0.30	0.30—2.00
	M	Standard	UE6020	195—320	0.08—0.30	0.30—2.00



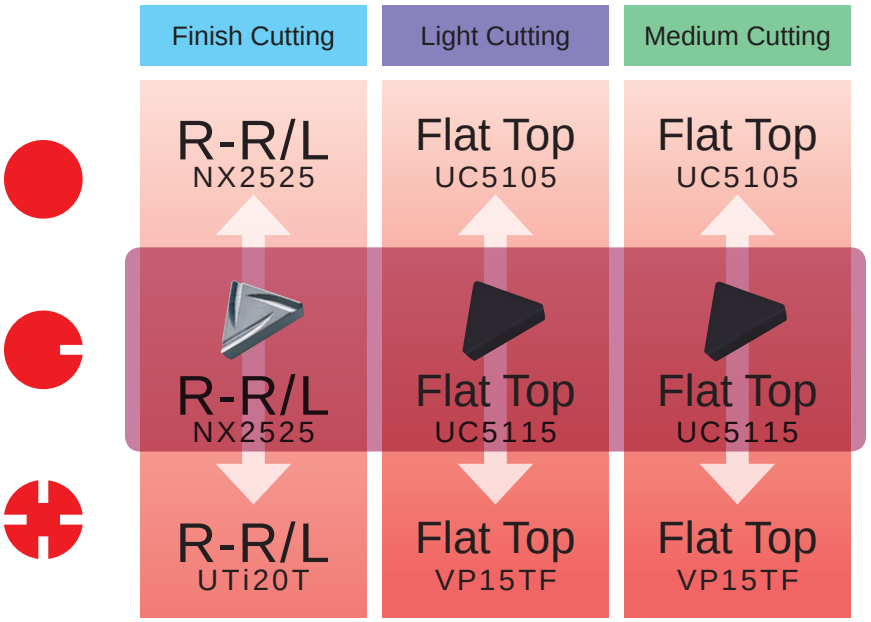
Stable Cutting
General Cutting
Unstable Cutting
F Finish Cutting
L Light Cutting
M Medium Cutting

P Carbon Steel • Alloy Steel (Ex : S45C, SCM440)

11°POSITIVE INSERTS WITHOUT HOLE

vc : Cutting Speed
f : Feed
ap : Depth of Cut

	Cutting Area	1st Recommendation				
		Chip Breaker	Grade	vc (m/min)	f (mm/rev)	ap (mm)
Stable Cutting	F	R-R/L	NX2525	165—240	0.05—0.12	0.20—0.60
	L	Standard	NX2525	140—200	0.08—0.30	0.30—2.00
	M	Standard	NX2525	140—200	0.08—0.30	0.30—2.00
General Cutting	F	R-R/L	NX2525	165—240	0.05—0.12	0.20—0.60
	L	Standard	UE6110	155—260	0.08—0.30	0.30—2.00
	M	Standard	UE6110	155—260	0.08—0.30	0.30—2.00
Unstable Cutting	F	R-R/L	UTi20T	85—120	0.05—0.12	0.20—0.60
	L	Standard	UE6020	145—240	0.08—0.30	0.30—2.00
	M	Standard	UE6020	145—240	0.08—0.30	0.30—2.00



Stable Cutting
General Cutting
Unstable Cutting
F Finish Cutting
L Light Cutting
M Medium Cutting

K Cast Iron • Ductile Cast Iron (Ex : FC300)

11°POSITIVE INSERTS WITHOUT HOLE

vc : Cutting Speed
f : Feed
ap : Depth of Cut

	Cutting Area	1st Recommendation				
		Chip Breaker	Grade	vc (m/min)	f (mm/rev)	ap (mm)
Stable Cutting	F	R-R/L	NX2525	145—200	0.05—0.12	0.20—0.60
	L	Flat Top	UC5105	135—245	0.08—0.30	0.30—2.00
	M	Flat Top	UC5105	135—245	0.08—0.30	0.30—2.00
General Cutting	F	R-R/L	NX2525	145—200	0.05—0.12	0.20—0.60
	L	Flat Top	UC5115	130—240	0.08—0.30	0.30—2.00
	M	Flat Top	UC5115	130—240	0.08—0.30	0.30—2.00
Unstable Cutting	F	R-R/L	UTi20T	80—115	0.05—0.12	0.20—0.60
	L	Flat Top	VP15TF	115—160	0.08—0.30	0.30—2.00
	M	Flat Top	VP15TF	115—160	0.08—0.30	0.30—2.00