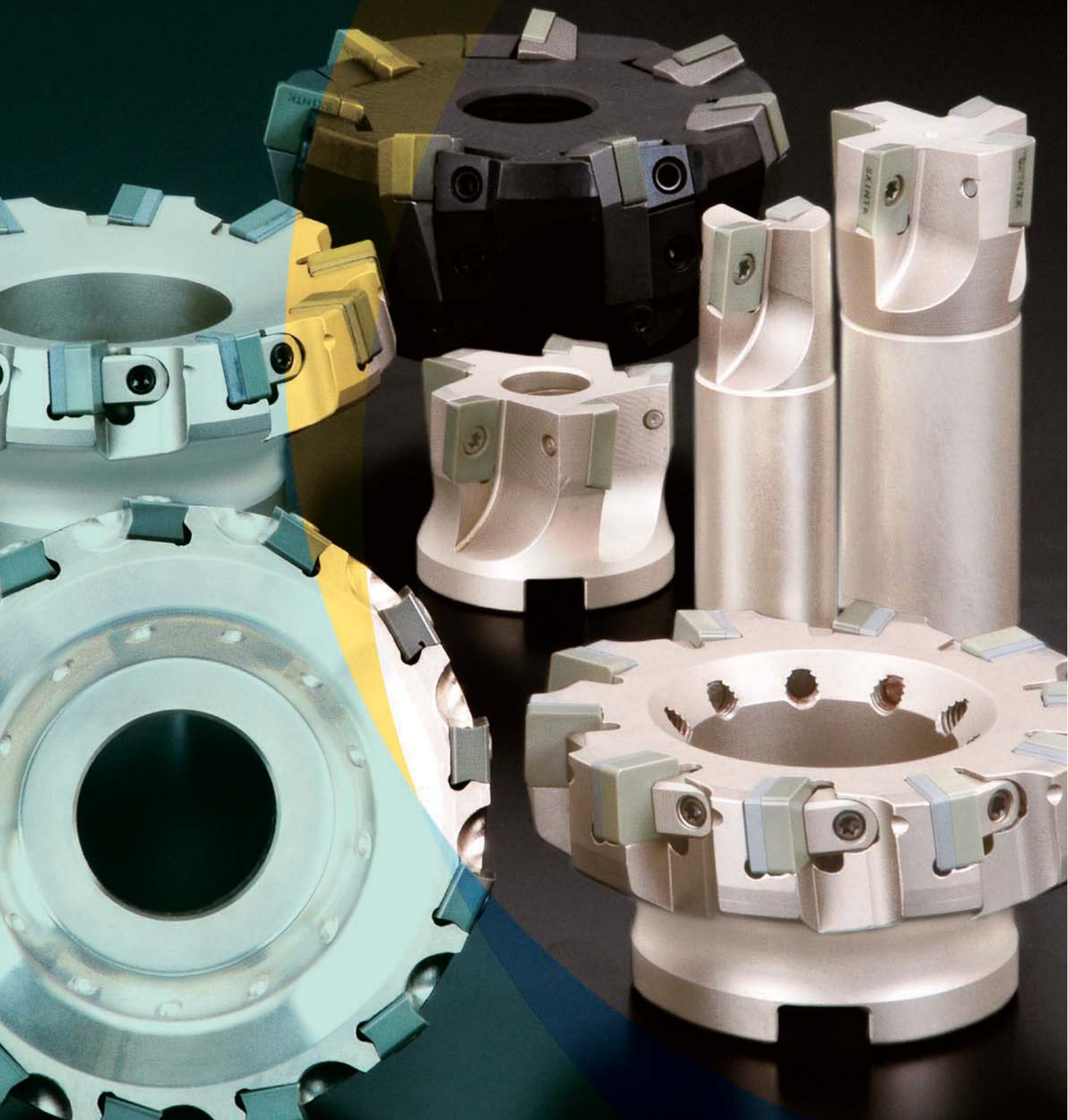


NTK

www.ngkntk.de/ntk/de
www.ntkcuttingtools.co.uk
www.ngkntk.co.jp

CERAMIC MILLING TOOLS





XTM series

High feed machining
Low cutting force with high rake insert.

Hochgeschwindigkeitsbearbeitung
Geringer Schnittdruck mit Rechteck-
Wendeschneidplatte.

*Lavorazione ad alta velocita'
Basse forze di taglio con elevati angoli di
spoglia.*

→ P.08

FDX series

Economical 8 cutting edge.
Insert with Chipbreaker offers low
cutting force. Easy clomp system.

Wirtschaftlich mit 8 Schneiden.
Geringer Schneiddruck mit Spanbrecher.
Leicht zu bedienendes Klemmsystem.

*8 taglienti economici.
basse forze di taglio con inserti con
rompitruciolo.
Facile sistema di bloccaggio.*

→ P.04



SFN series

Precision cutter adjustment for super
finishing.

Sehr gute Schlichtbearbeitung durch
justierbares System.
Gute Oberflächenergebnisse.

*Superfinitura con sistema di regolazione
Buone condizioni superficiali.*

→ P.10



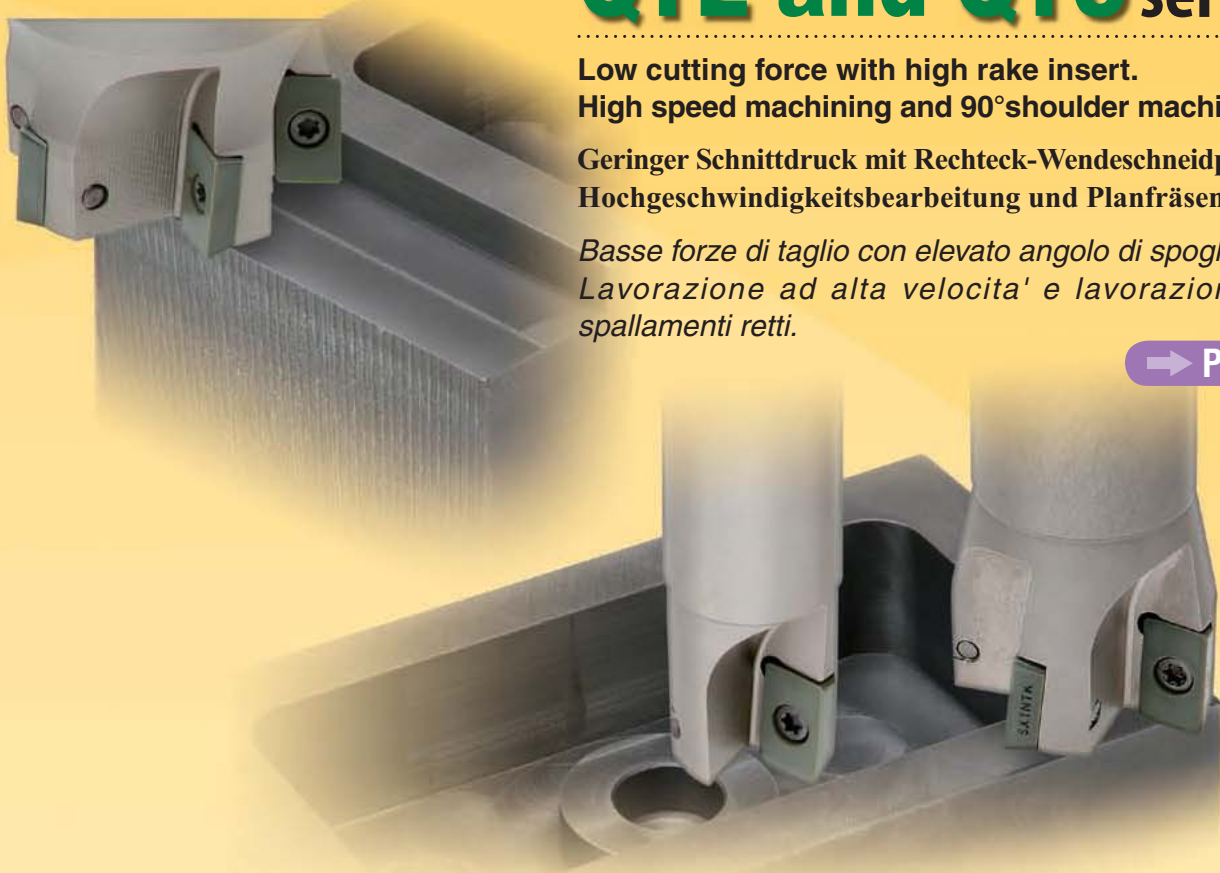
QTE and QTS series

Low cutting force with high rake insert.
High speed machining and 90° shoulder machining.

Geringer Schnittdruck mit Rechteck-Wendeschneidplatte.
Hochgeschwindigkeitsbearbeitung und Planfräsen 90°.

Basse forze di taglio con elevato angolo di spoglia
Lavorazione ad alta velocità e lavorazione di
spallamenti retti.

→ P.12



INSERTS

High speed machining with excellent
wear and fracture resistance.

Hochgeschwindigkeitsbearbeitung mit hohem
Widerstand gegen Verschleiß und Bruch.

Lavorazione ad alta velocità con elevata
resistenza all'usura ed alta tenacità.

→ P.16



FDX Series (Rough operation)

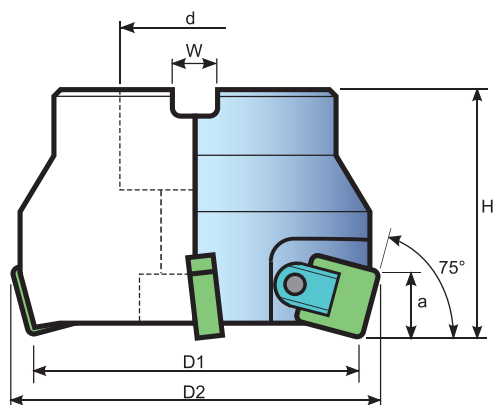


A.R.-6°
R.R.-10°

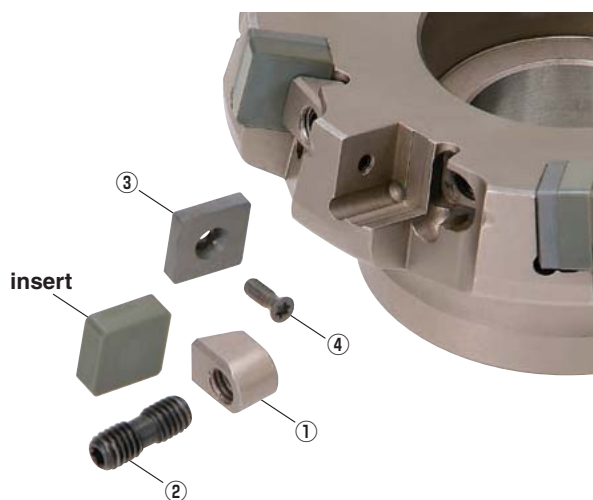


75°
Lead Angle

12.5 / 6.3



Item-No. Teile-Nr. Articolo		D1	D2	H	a	d	W	Clamp bolt Klemmschraube Vite a brugola	
FDX063-75-06R	6	63	70	50	12	22	10.4	CB912.10	0.75
FDX080-75-08R	8	80	87	50	12	27	12.4	CB912.12	1.3
FDX100-75-10R	10	100	107	50	12	32	14.4	CB912.17	1.85
FDX125-75-12R	12	125	132	63	12	40	16.4		2.1



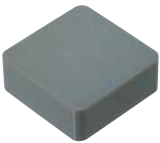
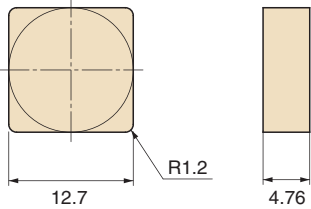
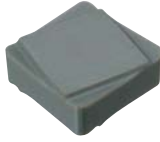
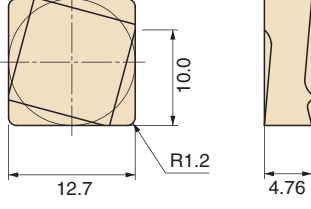
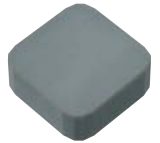
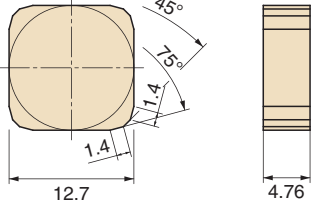
Spare Parts . Ersatzteile . Parti di ricambio

① Clamp Pratze Staffa	② Clamp screw Klemmschraube Vite per staffa	③ Shim Unterlegplatte Sottopiacchetta	④ Shim screw Schraube für Unterlegplatte Vite per sottopiacchetta
			
W6226	T15 WS1266	S3212	T9 SS1630
Clamp bolt Klemmschraube Vite a brugola	Driver Schlüssel Cacciavite		Driver Schlüssel Cacciavite
			
	T15 K5615		T9 K5609

Recommended cutting condition Anwendungsbeispiele und Schnittwerte Parametri di taglio

Grade Sorte Grado	Work Material Material Materiale da lavorare		Cutting speed (m/min) Schnittgeschwindigkeit (m/min) Velocità di taglio (m/min)								Feed (mm/tooth) Vorschub (mm/Z) Avanzamento (mm/g)						Ap(mm) Prof.di taglio (mm)
	K		400	500	600	700	800	900	1000	1100	0.05	0.1	0.15	0.2	0.25	0.3	
SX1	Cast iron Grauguss Ghisa	○															~ 6 (mm)
SX6		●															
SX9	Ductile Sphäroguss Nodulare																

Insert . Schneidplatten . Inserti

Shape Form Forma	Dimensions Abmessungen Dimensioni	Item-No. Teile-Nr. Articolo	Grade Sorte Grado
 12.5		Standard Standart Normale SNGN 120412 TNF (T02025)	
			SX1 ●
			SX6 ●
			SX9 ●
 12.5		Chip Breaker Spanbrecher Rompitruciolo SNGF 120412 TRCC421 (T01025)	SX1 ●
 6.3		Wiper Wiper Raschiante SNGN 1204 ENT01025	SX1 ●
			SX6 ○
			SX9 ○

● : **Stock item**
 Lagerartikel
 Articolo a magazzino

○ : **No stock item**
 Kein Lagerartikel
 Articolo non a magazzino

NTK


Germany

Tel : +49 2102 974 350

Fax : +49 (0)2102 974 399

www.ngkntk.de/ntk/de


Italy

Tel : +39 02 488 86 91

Fax : +39 02 488 42 717



UK

Tel : +44 1442 281 071

Fax : +44 1442 281 080

www.ntkcuttingtools.co.uk

FDX Series (Rough operation)

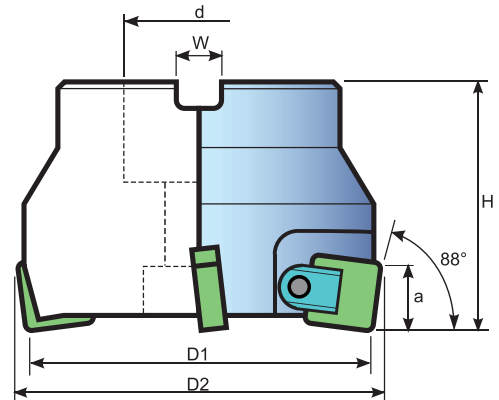


A.R.-6°
R.R.-10°

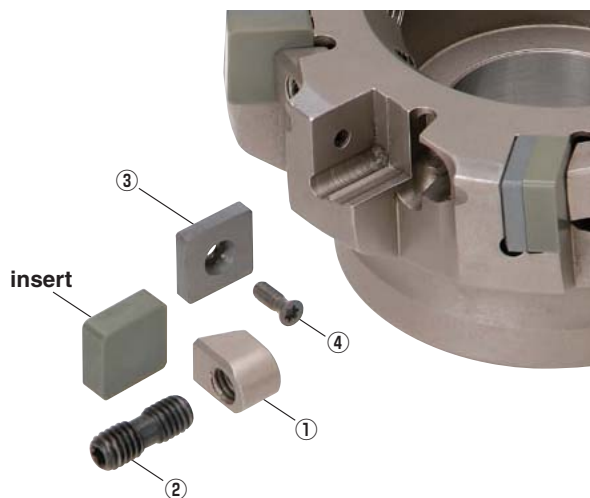


Lead Angle

12.5 / 6.3



Item-No. Teile-Nr. Articolo		D1	D2	H	a	d	W	Clamp bolt Klemmschraube Vite a brugola	
FDX063-88-06R	6	63	64	50	12	22	10.4	CB912.10	0.75
FDX080-88-08R	8	80	81	50	12	27	12.4	CB912.12	1.3
FDX100-88-10R	10	100	101	50	12	32	14.4	CB912.17	1.85
FDX125-88-12R	12	125	126	63	12	40	16.4		2.1



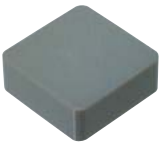
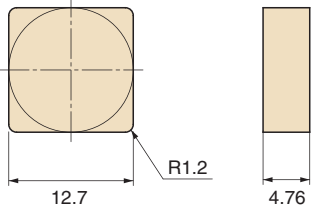
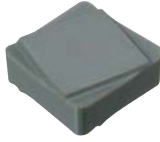
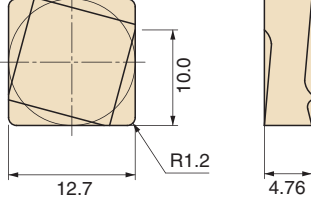
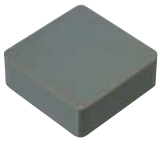
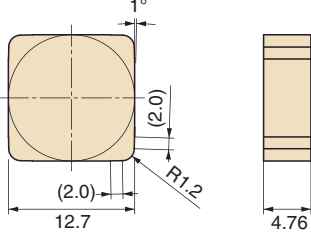
Spare Parts . Ersatzteile . Parti di ricambio

①	Clamp Pratze Staffa	②	Clamp screw Klemmschraube Vite per staffa	③	Shim Unterlegplatte Sottopiacchetta	④	Shim screw Schraube für Unterlegplatte Vite per sottopiacchetta
			T15				T9
	W6226		WS1266		S3212		SS1630
	Clamp bolt Klemmschraube Vite a brugola		Driver Schlüssel Cacciavite				Driver Schlüssel Cacciavite
							
			T15				T9
			K5615				K5609

Recommended cutting condition Anwendungsbeispiele und Schnittwerte Parametri di taglio

Grade Sorte Grado	Work Material Material Materiale da lavorare		Cutting speed (m/min) Schnittgeschwindigkeit (m/min) Velocità di taglio (m/min)								Feed (mm/tooth) Vorschub (mm/Z) Avanzamento (mm/g)						Ap(mm) Prof.di taglio (mm)
	K		400	500	600	700	800	900	1000	1100	0.05	0.1	0.15	0.2	0.25	0.3	
SX1	Cast iron Grauguss Ghisa	○															~ 6 (mm)
SX6		●															
SX9	Ductile Sphäroguss Nodulare																

Insert . Schneidplatten . Inserti

Shape Form Forma	Dimensions Abmessungen Dimensioni	Item-No. Teile-Nr. Articolo	Grade Sorte Grado
 12.5		Standard Standart Normale SNGN 120412 TNF (T02025)	
			SX1 ●
			SX6 ●
			SX9 ●
 12.5		Chip Breaker Spanbrecher Rompitruciolo SNGF 120412 TRCC421 (T01025)	SX1 ●
 6.3		Wiper Wiper Raschiante SNEN 1204 ZNTNC-Z118 (T01025)	SX1 ●
			SX6 ○
			SX9 ○

● : **Stock item**
 Lagerartikel
 Articolo a magazzino

○ : **No stock item**
 Kein Lagerartikel
 Articolo non a magazzino

NTK


Germany

Tel : +49 2102 974 350

Fax : +49 (0)2102 974 399

www.ngkntk.de/ntk/de


Italy

Tel : +39 02 488 86 91

Fax : +39 02 488 42 717



UK

Tel : +44 1442 281 071

Fax : +44 1442 281 080

www.ntkcuttingtools.co.uk

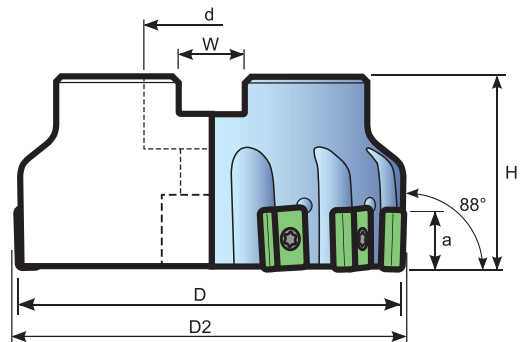
XTM Series (Rough operation)



A.R.-4°
R.R.0°



Lead Angle
12.5°



Item-No. Teile-Nr. Articolo		D1	D2	H	a	d	W	Clamp bolt Klemmschraube Vite a brugola	
XTM080-88-10R	10	80	83	50	14	20	12.4	CB912.12	1.3
XTM100-88-13R	13	100	103	50	14	25	14.4	CB912.17	1.85
XTM125-88-16R	16	125	128	50	14	32	16.4		2.1

Spare Parts . Ersatzteile . Parti di ricambio

Clamp screw
Klemmschraube
Vite per staffa



T15
LRIS-4×12

Driver
Schlüssel
Cacciavite

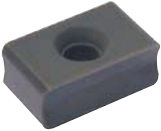
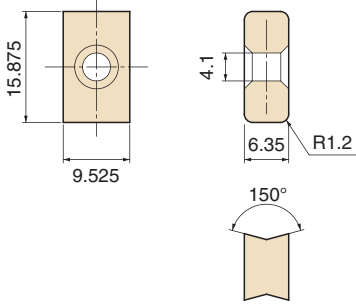


T15
K5615

Recommended cutting condition Anwendungsbeispiele und Schnittwerte Parametri di taglio

Grade Sorte Grado	Work Material Material Materiale da lavorare		Cutting speed (m/min) Schnittgeschwindigkeit (m/min) Velocità di taglio (m/min)								Feed (mm/tooth) Vorschub (mm/Z) Avanzamento (mm/g)						Ap(mm) Prof.di taglio (mm)
	K		400	500	600	700	800	900	1000	1100	0.05	0.1	0.15	0.2	0.25	0.3	
SX1	Cast iron Grauguss Ghisa	○															~ 8 (mm)
SX6		●															
SX9	Ductile Sphäroguss Nodulare																

Insert . Schneidplatten . Inserti

Shape Form Forma	Dimensions Abmessungen Dimensioni	Item-No. Teile-Nr. Articolo	Grade Sorte Grado
  		LNX 324-12T01020	
			SX1 ●
			SX6 ○
			SX9 ○

● : Stock item
Lagerartikel
Articolo a magazzino

○ : No stock item
Kein Lagerartikel
Articolo non a magazzino

NTK



Germany

Tel : +49 2102 974 350

Fax : +49 (0)2102 974 399

www.ngkntk.de/ntk/de



Italy

Tel : +39 02 488 86 91

Fax : +39 02 488 42 717



UK

Tel : +44 1442 281 071

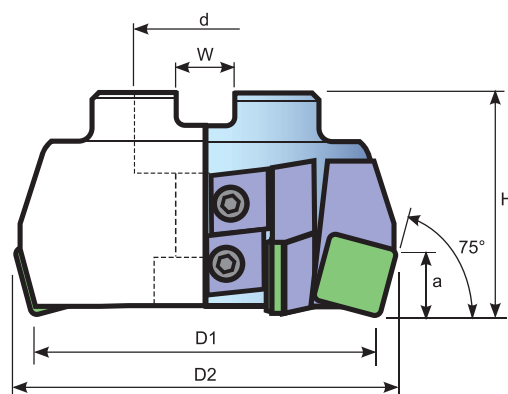
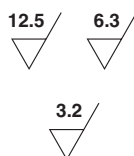
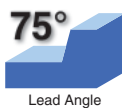
Fax : +44 1442 281 080

www.ntkcuttingtools.co.uk

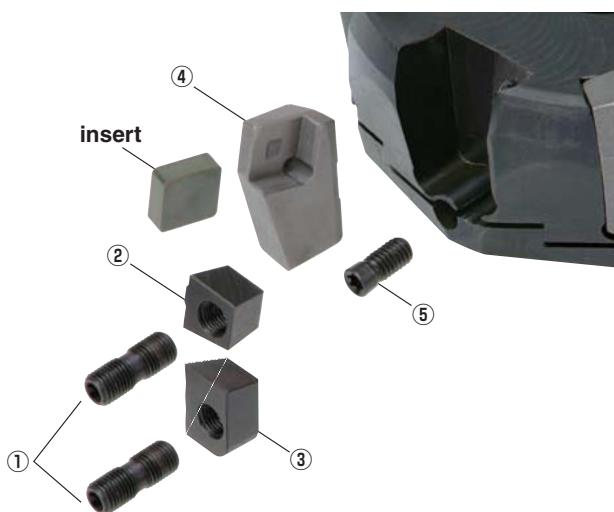
SFN Series (Finish operation)



A.R.-8°
R.R.-8°



Item-No. Teile-Nr. Articolo	Old Alt Vecchio		D1	D2	H	a	d	W	Clamp bolt Klemmschraube Vite a brugola	
SFN080-75-05R	044299080-C	8	80	86	50	9	27	12.4	912.12	1.2
SFN100-75-07R	044299100-C	10	100	106	50	9	32	14.4	912.17	1.95
SFN125-75-08R	044299125-C	12	125	131	50	9	40	16.4		3.25



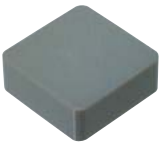
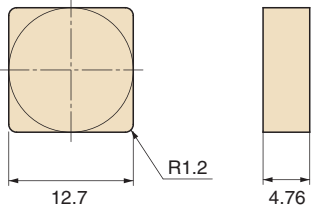
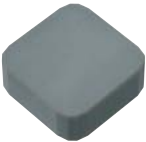
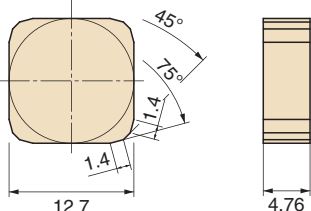
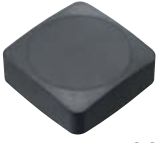
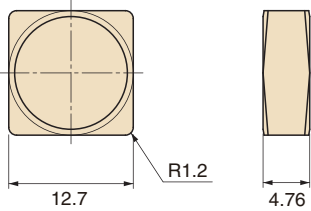
Spare Parts . Ersatzteile . Parti di ricambio			
① Wedge screw Schraube für Klemme Vite per cuneo	② Wedge Klemme Cuneo	③ Wedge Klemme Cuneo	④ Cartridge Kassette Cartuccia
			
T20 WS1077	W6432	W6438	C6912
⑤ Adjust screw Einstellschraube Vite di regolazione	Clamp bolt Klemmschraube Vite a brugola	Driver Schlüssel Cacciavite	
			
T20 AS1460		T20 K5620	

Recommended cutting condition Anwendungsbeispiele und Schnittwerte Parametri di taglio

Grade Sorte Grado	Work Material Material Materiale da lavorare		Cutting speed (m/min) Schnittgeschwindigkeit (m/min) Velocità di taglio (m/min)							Feed (mm/tooth) Vorschub (mm/Z) Avanzamento (mm/g)						Ap(mm) Prof.di taglio (mm)
	K		400	500	600	700	800	900	1000	1100	0.05	0.1	0.15	0.2	0.25	0.3
SX1	Cast iron Grauguss Ghisa	○														
SX6		●														
SX9	Ductile Sphäroguss Nodulare															

~ 6
(mm)

Insert . Schneidplatten . Inserti

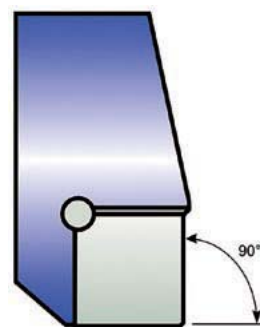
Shape Form Forma	Dimensions Abmessungen Dimensioni	Item-No. Teile-Nr. Articolo	Grade Sorte Grado
 12.5		Standard Standart Normale SNGN 120412 TNF (T02025)	 SX1 ● SX6 ● SX9 ●
 6.3		Wiper Wiper Raschiante SNGN 1204 ENT01025	 SX1 ● SX6 ○ SX9 ○
 3.2		Super finish Feinstschlichten Super finitura SNEN 120412 TNX07 (Special)	 HC6 ●

● : Stock item
Lagerartikel
Articolo a magazzino

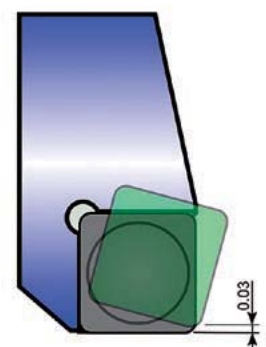
○ : No stock item
Kein Lagerartikel
Articolo non a magazzino

Option . Option . Opzione

Super finish Cartridge
Präzisions Kassette
Cartuccia per superfinitura



6912-S-C



NTK



Germany

Tel : +49 2102 974 350

Fax : +49 (0)2102 974 399

www.ngkntk.de/ntk/de



Italy

Tel : +39 02 488 86 91

Fax : +39 02 488 42 717



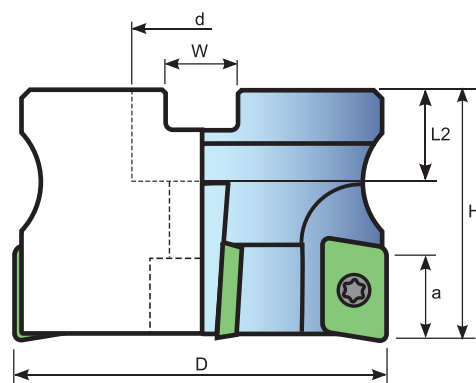
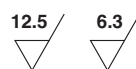
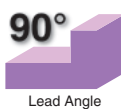
UK

Tel : +44 1442 281 071

Fax : +44 1442 281 080

www.ntkcuttingtools.co.uk

QTS Shell Type



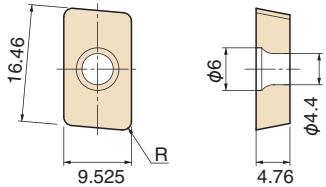
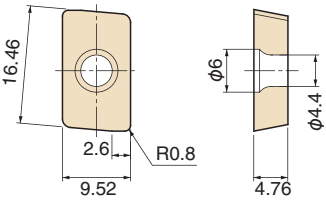
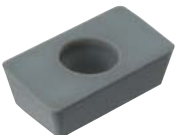
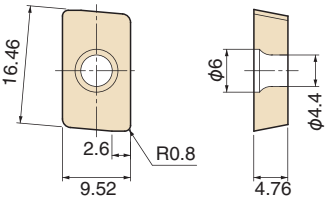
Item-No. Teile-Nr. Articolo		D	L	L2	a	d	W	Clamp bolt Klemmschraube Vite a brugola	
QTS040-90-4R	4	40	40	20	14	16	8.4	CB1058	0.2
QTS050-90-6R	6	50	40	22	14	22	10.4	CB912.10	0.3
QTS063-90-6R	6	63	50	25	14	27	10.4	CB912.12	0.65

Spare Parts . Ersatzteile . Parti di ricambio		
Clamp screw Klemmschraube Vite per staffa  T15 CS1240	Driver Schlüssel Cacciavite  T15 K5615	Clamp bolt Klemmschraube Vite a brugola  CB1058 CB912.10 CB912.12

Recommended cutting condition Anwendungsbeispiele und Schnittwerte Parametri di taglio

Grade Sorte Grado	Work Material Material Materiale da lavorare		Cutting speed (m/min) Schnittgeschwindigkeit (m/min) Velocità di taglio (m/min)								Feed (mm/tooth) Vorschub (mm/Z) Avanzamento (mm/g)						Ap(mm) Prof.di taglio (mm)
	K		400	500	600	700	800	900	1000	1100	0.05	0.1	0.15	0.2	0.25	0.3	
SX1	Cast iron Grauguss Ghisa	○															~ 8 (mm)
SX6		●															
SX9	Ductile Sphäroguss Nodulare																

Insert . Schneidplatten . Inserti

Shape Form Forma	Dimensions Abmessungen Dimensioni	Item-No. Teile-Nr. Articolo	R	Grade Sorte Grado
   12.5	  6.3	APCW 160408 T01020	0.8	SX1 ● SX6 ○ SX9 ○
		APCW 160412 T01020	1.2	SX1 ● SX6 ○ SX9 ○
		APCW 160420 T01020	2.0	SX1 ● SX6 ○ SX9 ○
		Wiper Wiper Raschiante APCW 1604 PDTR01020		SX1 ● SX6 ○ SX9 ○

● : Stock item
Lagerartikel
Articolo a magazzino

○ : No stock item
Kein Lagerartikel
Articolo non a magazzino

NTK



Germany

Tel : +49 2102 974 350

Fax : +49 (0)2102 974 399

www.ngkntk.de/ntk/de



Italy

Tel : +39 02 488 86 91

Fax : +39 02 488 42 717



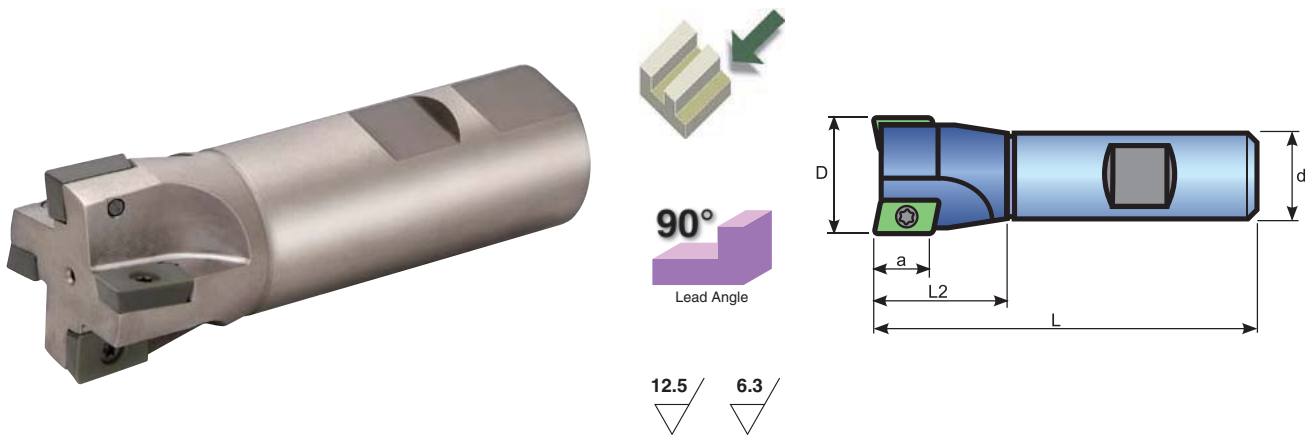
UK

Tel : +44 1442 281 071

Fax : +44 1442 281 080

www.ntkcuttingtools.co.uk

QTE Endmill

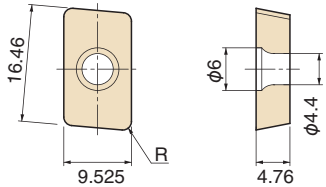
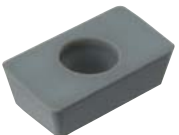
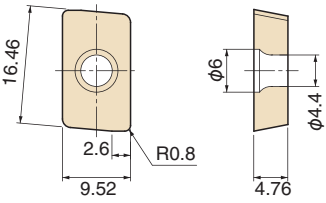


Item-No. Teile-Nr. Articolo		D	L	L2	a	d	 Kg
QTE020-90-1R	1	20	100	30	14	20	0.2
QTE025-90-2R	2	25	100	30	14	25	0.35
QTE032-90-3R	3	32	110	35	14	32	0.6
QTE040-90-4R	4	40	110	35	14	32	0.65

Spare Parts . Ersatzteile . Parti di ricambio	
Clamp screw Klemmschraube Vite per staffa  T15 CS1240	Driver Schlüssel Cacciavite  T15 K5615

Recommended cutting condition Anwendungsbeispiele und Schnittwerte Parametri di taglio			Cutting speed (m/min) Schnittgeschwindigkeit (m/min) Velocità di taglio (m/min)								Feed (mm/tooth) Vorschub (mm/Z) Avanzamento (mm/g)						Ap(mm) Prof.di taglio (mm)
Grade Sorte Grado	Work Material Material Materiale da lavorare		400	500	600	700	800	900	1000	1100	0.05	0.1	0.15	0.2	0.25	0.3	
SX1	Cast iron Grauguss Ghisa	○															~ 8 (mm)
SX6		●															
SX9	Ductile Sphäroguss Nodulare																

Insert . Schneidplatten . Inserti

Shape Form Forma	Dimensions Abmessungen Dimensioni	Item-No. Teile-Nr. Articolo	R	Grade Sorte Grado
		APCW 160408 T01020	0.8	SX1 ● SX6 ○ SX9 ○
		APCW 160412 T01020	1.2	SX1 ● SX6 ○ SX9 ○
		APCW 160420 T01020	2.0	SX1 ● SX6 ○ SX9 ○
		Wiper Wiper Raschiante APCW 1604 PDTR01020		SX1 ● SX6 ○ SX9 ○

● : Stock item
Lagerartikel
Articolo a magazzino

○ : No stock item
Kein Lagerartikel
Articolo non a magazzino

NTK



Germany

Tel : +49 2102 974 350

Fax : +49 (0)2102 974 399

www.ngkntk.de/ntk/de



Italy

Tel : +39 02 488 86 91

Fax : +39 02 488 42 717



UK

Tel : +44 1442 281 071

Fax : +44 1442 281 080

www.ntkcuttingtools.co.uk

HIGH SPEED MACHINING for Cast Iron

HIGH SPEED MACHINING for Cast Iron

Hochgeschwindigkeitsbearbeitung von Gusseisen

Lavorazione ad alta velocità di ghisa

NTK Silicon nitride Ceramics Silizium Nitrid Keramik Ceramiche al nitruro di silicio

Feature Merkmale Caratteristica

Better Notch Wear resistance

Höherer Widerstand gegen

Kerbverschleiß

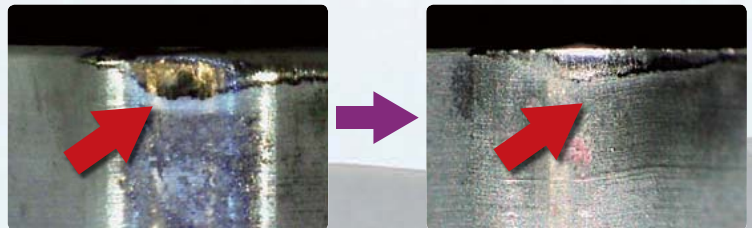
Miglior resistenza all'usura per intaglio



Better Wear resistance

Höherer Verschleißwiderstand

Miglior resistenza all'usura

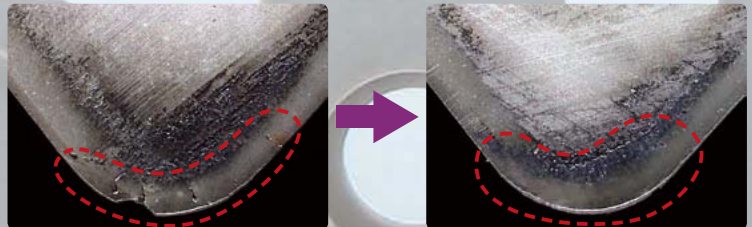


Better Thermal Shock resistance

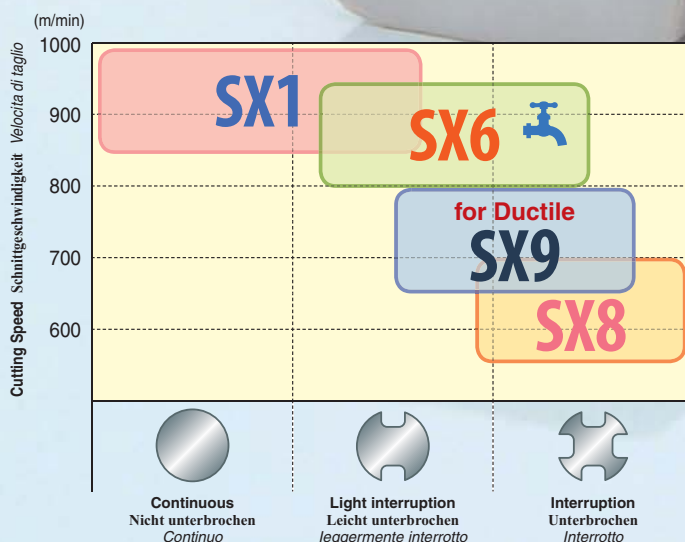
Höherer Widerstand gegen

Thermoschock

Miglior resistenza agli shock termici



Grade range Substratbereiche Gamma di gradi



SX1

Excellent wear resistance at high speed
Sehr guter Verschleißwiderstand bei hohen
Schnittgeschwindigkeiten
Elevata resistenza all'usura alle alte velocità

SX6

Excellent notch wear resistance
Can be used with coolant
Sehr guter Verschleißwiderstand gegen Kerbverschleiß
Einsatzmöglichkeit bei Naßbearbeitung
Elevata resistenza all'usura per intaglio
Possibile lavorare ad umido

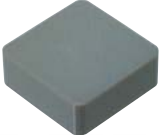
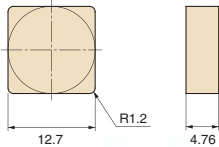
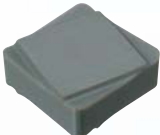
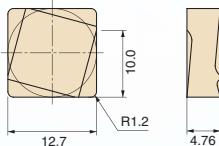
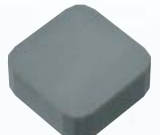
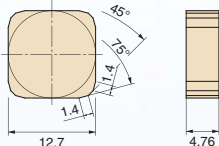
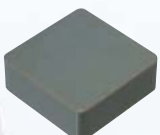
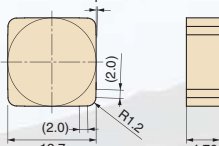
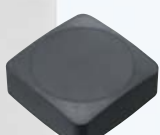
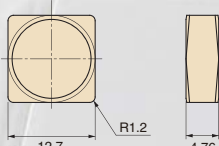
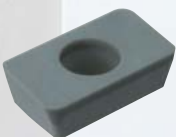
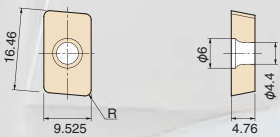
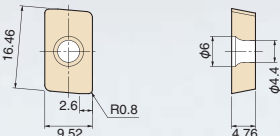
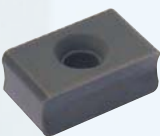
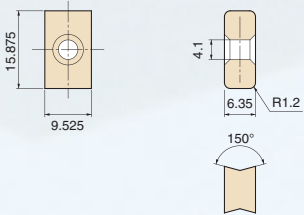
SX8

For heavy interrupted machining
Für stark unterbrochene Bearbeitung
Per lavorazioni a forte taglio interrotto

SX9

For Ductile cast iron machining
Für Sphärogussbearbeitung
Lavorazione di ghisa sferoidale

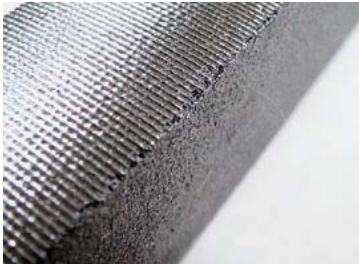
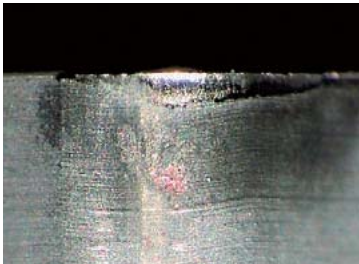
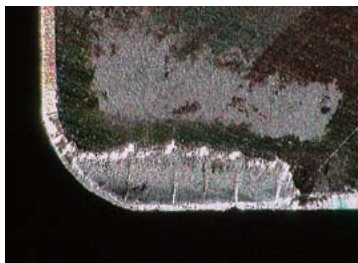
Insert . Schneidplatten . Inserti

Shape Form Forma	Dimensions Abmessungen Dimensioni	Item-No. Teile-Nr. Articolo	Grade Sorte Grado
		Standard SNGN 120412 TNF (T02025)	
			SX1 ●
			SX6 ●
			SX9 ●
		Chip Breaker SNGF 120412 TRCC421 (T01025)	
			SX1 ●
		Wiper for 75° SNGN 1204 ENT01025	
			SX1 ●
			SX6 ○
			SX9 ○
		Wiper for 88° SNEN 1204 ZNTNC-Z118 (T01025)	
			SX1 ●
			SX6 ○
			SX9 ○
		Super finish SNEN 120412 TNX07	
			HC6 ●
			
		APCW 160408 T01020	R 0.8 SX1 ●
		APCW 160412 T01020	1.2 SX1 ●
		APCW 160420 T01020	2.0 SX1 ●
		Wiper APCW 1604 PDTR01020	
			SX1 ●
		Extreme feed LNX 324-12 T01020	
			SX1 ●

● : Stock item
Lagerartikel
Articolo a magazzino

○ : No stock item
Kein Lagerartikel
Articolo non a magazzino

Solution , Abhilfe , Soluzione

Breakage of work piece Ausbrüche an Werkstück Rottura del pezzo 	Burr Gratbildung Bava 
Increase the cutting speed , reduce the feed rate Use smaller edge-preparation Reduce the notch wear Schnittgeschwindigkeit erhöhen, Vorschub reduzieren Verwenden Sie eine kleinere Kantenausführung Reduziert den Kerbverschleiß Aumentare la velocità di taglio, ridurre l'avanzamento Usare una preparazione del tagliente più piccola Ridurre l'avanzamento	Reduce the feed rate Use bigger approach angle Use smaller edge-preparation Reduzieren Sie den Vorschub Verwenden Sie einen größeren Anstellwinkel Verwenden Sie eine kleinere Kantenausführung Ridurre l'avanzamento Usare angolo d'attacco più grande Usare preparazione del tagliente più piccola
Normal Wear (Flank wear [VB]) Normaler Verschleiß (Freiflächen Verschleiß [VB]) Usura normale (Usura sul fianco [VB]) 	Notch wear [VC] Kerbverschleiß [VC] Usura per intaglio [VC] 
Reduce the cutting speed Increase the feed rate, increase nose-R size. Change the tool material for one higher in wear resistance Vermindern Sie die Schnittgeschwindigkeit Erhöhen Sie den Vorschub, erhöhen Sie den Schneidenradius. Verwenden Sie ein anderes Substrat zur Erhöhung des Verschleißwiderstandes Ridurre la velocità di taglio Aumentare l'avanzamento, aumentare il raggio di punta Cambiare il materiale dell'utensile con uno di maggiore resistenza all'usura	Change the tool material for one higher in wear resistance. Decrease the approach angle or change insert shape Verwenden Sie ein anderes Substrat zur Erhöhung des Verschleißwiderstandes Verkleinern Sie den Anstellwinkel oder wechseln Sie die Plattengeometrie Cambiare il materiale dell'utensile con uno di maggiore resistenza all'usura Diminuire l'angolo d'attacco o cambiare la forma dell'inserto
Breakage Ausbrüche Frattura e rottura 	Thermal shock crack Risse auf Grund thermischen Schocks Cricche da shock termico 
Review the cutting conditions (reduce " f x d "). Increase the amount of R-honing. Change the tool material for one higher in to chipping resistance. Überprüfen Sie die Schnittwerte (reduzieren Sie " f x d "). Erhöhen Sie die Kantenverrundung Verwenden Sie ein anderes Substrat zur Erhöhung des Widerstandes gegen Kerbverschleiß Ridurre la velocità di taglio Aumentare la dimensione dell'onatura del tagliente Cambiare il materiale dell'utensile con uno di maggiore resistenza all'usura	Reduce the cutting speed Change wet cutting to dry cutting. Change the tool material for thermal shock resistance. Reduzieren Sie die Schnittgeschwindigkeit Wechseln Sie von der Naßbearbeitung zur Trockenbearbeitung. Verwenden Sie ein anderes Substrat zur Erhöhung des Widerstandes gegen Thermoschock Ridurre la velocità di taglio Togliere il refrigerante Cambiare il materiale dell'utensile con uno di maggiore resistenza agli shock termici