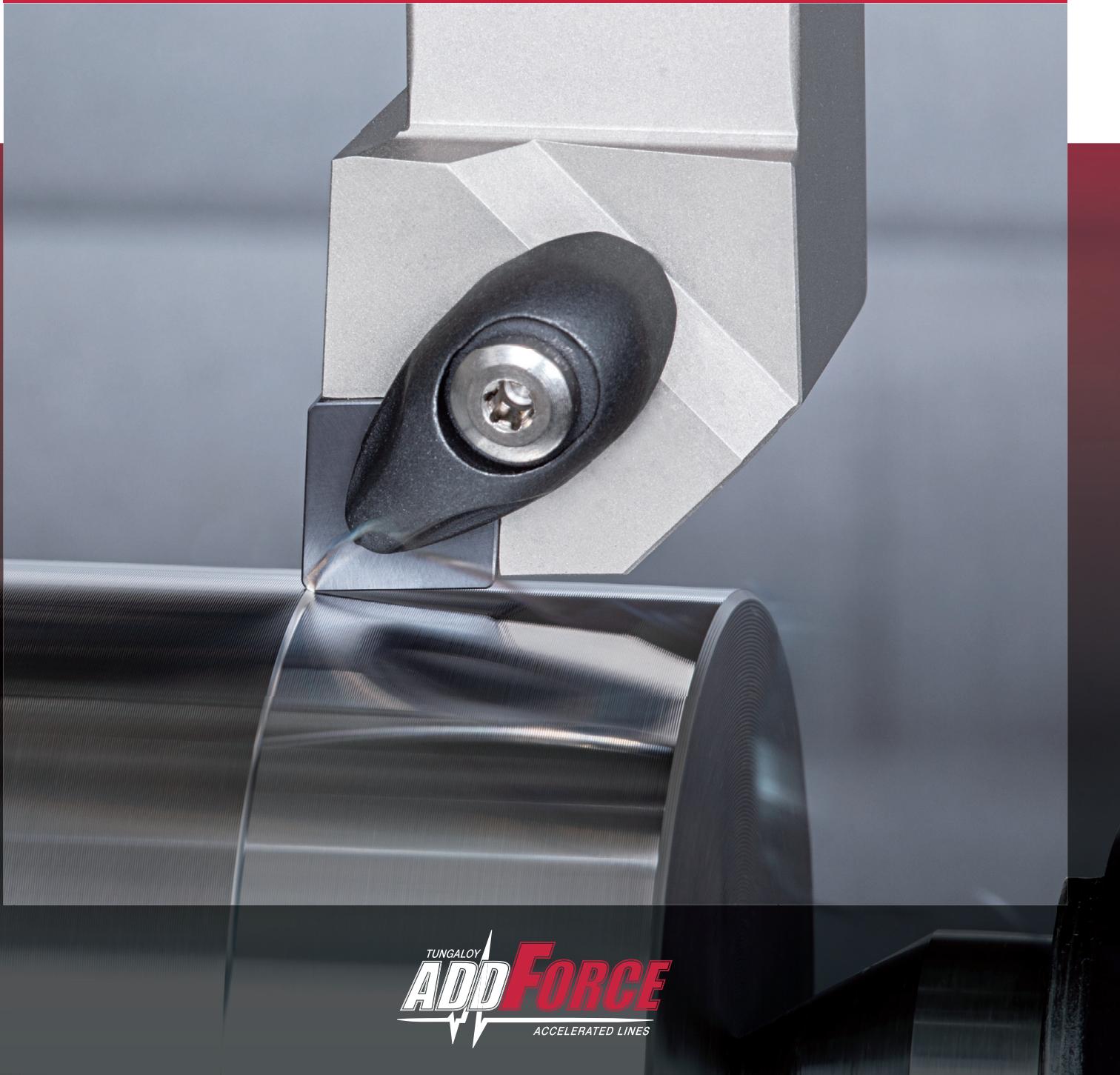
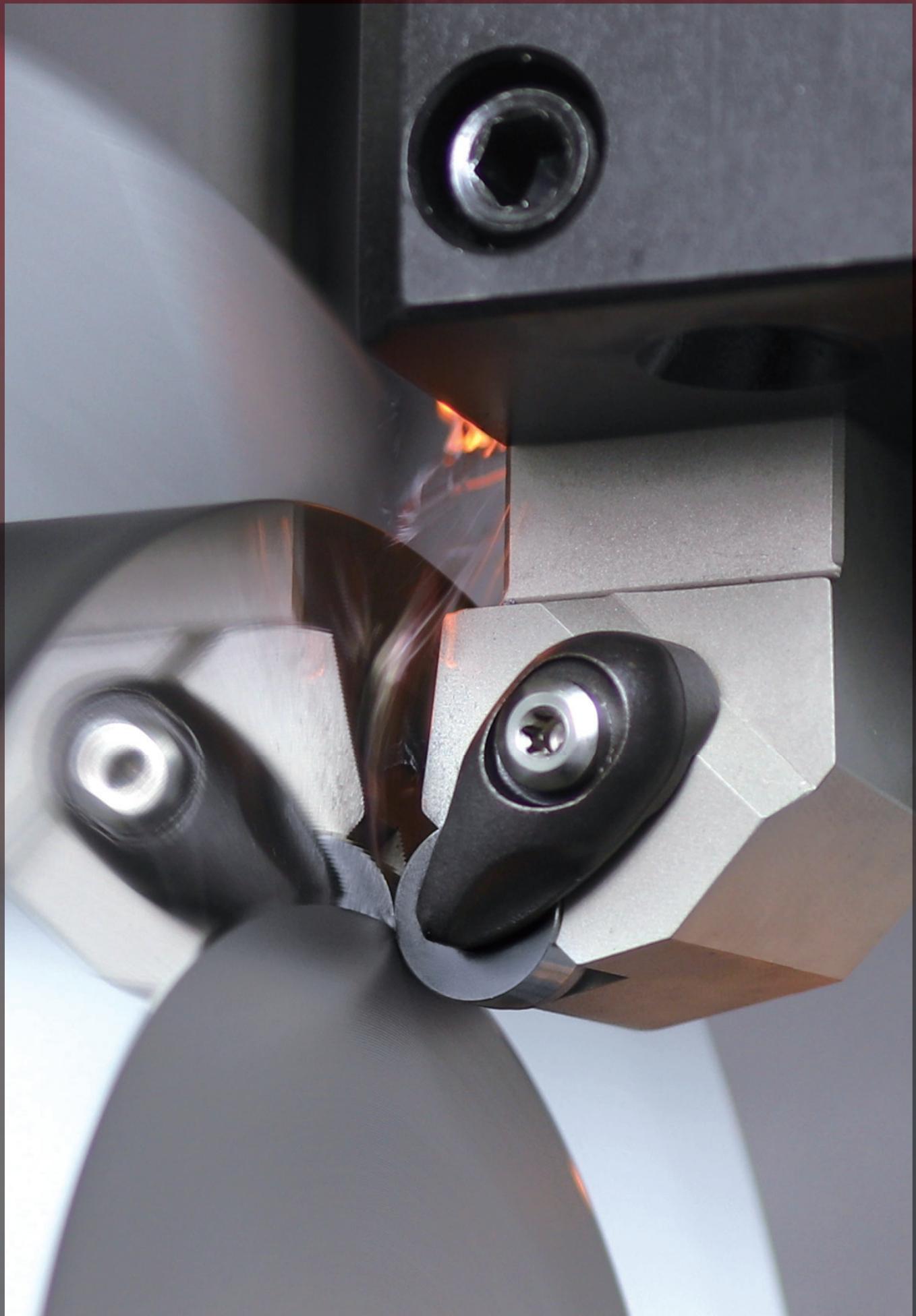


LX10

Tungaloy Report No. 542-US

Ceramic inserts for hardened steel machining

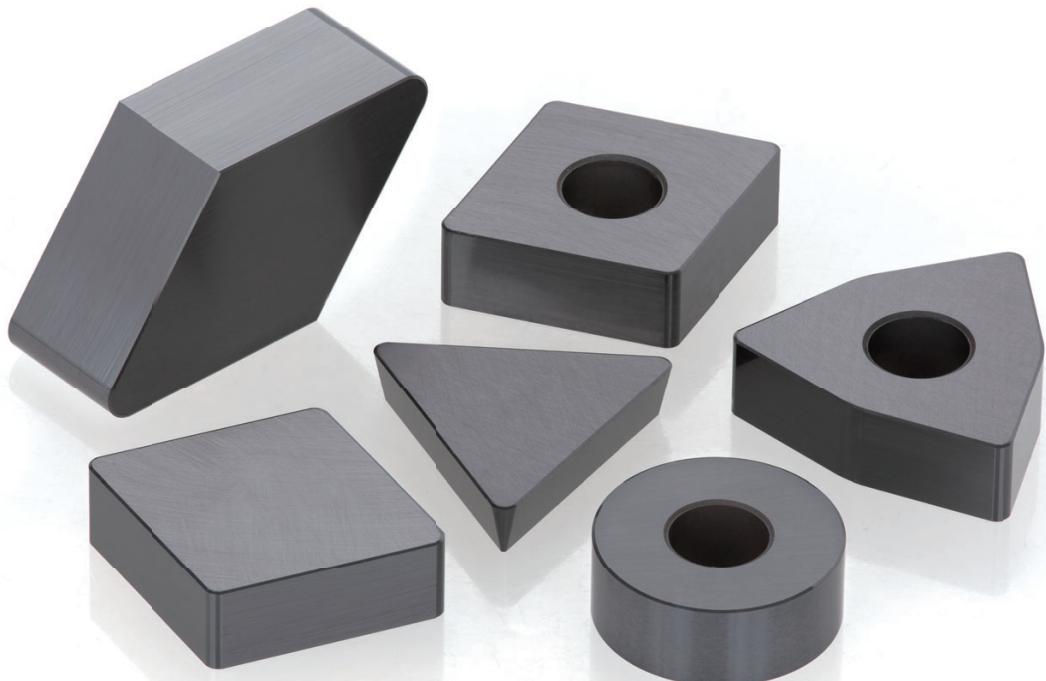




INDUSTRY 4.0
FEED the SPEED!



Leading ceramic grade - **LX10**



Expanded ceramic insert range for continuous cuts of
hardened steel parts

Economical option for continuous machining of hardened steels

LX10

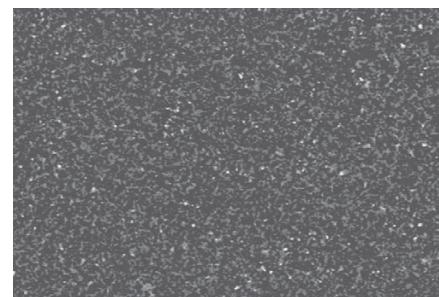
Consists of TiC mixed with aluminum oxide sintered to a highly dense, fine grain microstructure

High hardness and low coefficient of friction

→ **High wear resistance**

Fine microstructure

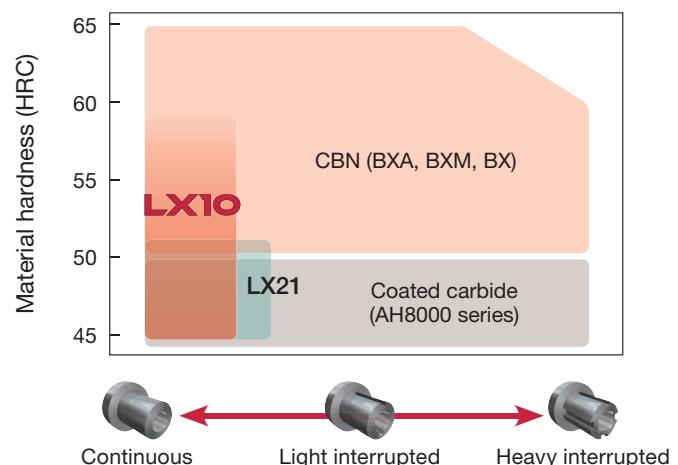
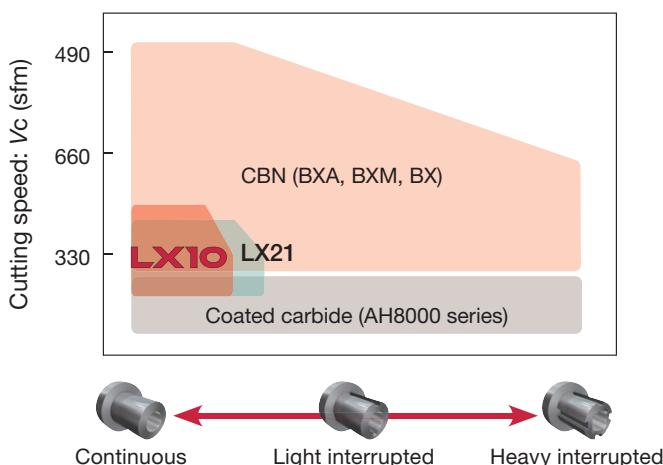
→ **Good machined surface roughness**



Microstructure image of LX10

Application range for hardened steel machining

- Suitable for medium speed continuous machining
- Surface quality < Rz 6.3 µm at various depths of cut
- Higher wear resistance than CBN for part hardness less than 55 HRC



STANDARD CUTTING CONDITIONS

ISO	Grade	Workpiece materials	Cutting mode	Coolant	Cutting speed Vc (sfm)	Feed f (ipr)	Depth of cut ap (in)
H	LX10	Hardened steel	Continuous	Wet	164 - 490	0.002 - 0.008	0.002 - 0.080

Insert NEGATIVE TYPE

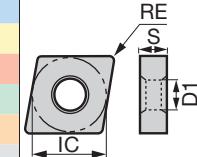
● : Continuous cutting
▲ : Light interrupted cutting
◆ : Heavy interrupted cutting

CN



Rhombic, 80°
with hole

P	Steel							
M	Stainless							
K	Cast iron							
N	Non-ferrous							
S	Superalloy							
H	Hard material							
●	●	●	●	●	●	●	●	●



Application	Chipbreaker	Designation		Ceramic								Dimension (in)			
		Inch	Metric		LX10	LX11	LX21	RE	IC	S	D1	RE	IC	S	D1
Finishing to medium cutting	-	CNGA 431	CNGA120404	● ▲ ●								0.016	0.500	0.188	0.203
		CNGA 432	CNGA120408	● ▲ ●								0.031	0.500	0.188	0.203
		CNGA 433	CNGA120412	● ▲ ●								0.047	0.500	0.188	0.203
		CNGA 434	CNGA120416	● ▲								0.063	0.500	0.188	0.203
		CNGA 435	CNGA120420	● ▲								0.078	0.500	0.188	0.203

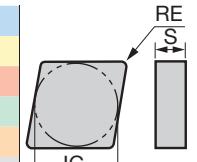
● : Line up
▲ : To be discontinued

CN



Rhombic, 80°
without hole

P	Steel							
M	Stainless							
K	Cast iron							
N	Non-ferrous							
S	Superalloy							
H	Hard material							
●	●	●	●	●	●	●	●	●



Application	Chipbreaker	Designation		Ceramic								Dimension (in)			
		Inch	Metric		LX10	LX11	LX21	RE	IC	S	D1	RE	IC	S	D1
Finishing to medium cutting	-	CNGN 431	CNGN120404	● ▲								0.016	0.500	0.187	-
		CNGN 432	CNGN120408	● ▲								0.031	0.500	0.187	-
		CNGN 433	CNGN120412	● ▲								0.047	0.500	0.187	-
		CNGN 434	CNGN120416	● ▲ ●								0.063	0.500	0.187	-
		CNGN 452	CNGN120708	● ▲								0.031	0.500	0.313	-
		CNGN 453	CNGN120712	● ▲								0.047	0.500	0.313	-
		CNGN 454	CNGN120716	● ▲								0.063	0.500	0.313	-

● : Line up
▲ : To be discontinued

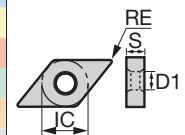
Insert NEGATIVE TYPE

● : Continuous cutting
 ▲ : Light interrupted cutting
 * : Heavy interrupted cutting

DN

Rhombic, 55° with hole

P	Steel																										
M	Stainless																										
K	Cast iron																										
N	Non-ferrous																										
S	Superalloy																										
H	Hard material																										
● ● ● ● ●																											



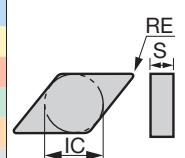
Application	Chipbreaker	Designation		Ceramic												Dimension (in)							
		Inch	Metric	LX10	LX11	LX21											RE	IC	S	D1			
Finishing to medium cutting		DNGA 431	DNGA150404	●	▲	●														0.016	0.500	0.187	0.203
		DNGA 432	DNGA150408	●	▲	●														0.031	0.500	0.187	0.203
		DNGA 433	DNGA150412	●	▲	●														0.047	0.500	0.187	0.203
		DNGA 441	DNGA150604	●	▲															0.016	0.500	0.250	0.203
		DNGA 442	DNGA150608	●	▲	●														0.031	0.500	0.250	0.203
		DNGA 443	DNGA150612	●	▲															0.047	0.500	0.250	0.203
		DNGA 444	DNGA150616	●	▲															0.063	0.500	0.250	0.203
		DNGA 445	DNGA150620	●	▲															0.079	0.500	0.250	0.203

● : Line up
 ▲ : To be discontinued

DN

Rhombic, 55° without hole

P	Steel																										
M	Stainless																										
K	Cast iron																										
N	Non-ferrous																										
S	Superalloy																										
H	Hard material																										
● ● ● ● ●																											



Application	Chipbreaker	Designation		Ceramic												Dimension (in)						
		Inch	Metric	LX10	LX11												RE	IC	S	D1		
Finishing to medium cutting		DNGN 432	DNGN150408	●	▲														0.031	0.500	0.187	-
		DNGN 452	DNGN150708	●	▲														0.031	0.500	0.313	-
		DNGN 453	DNGN150712	●	▲														0.047	0.500	0.313	-
		DNGN 454	DNGN150716	●	▲														0.063	0.500	0.313	-

● : Line up
 ▲ : To be discontinued

Insert NEGATIVE TYPE

● : Continuous cutting
 ● : Light interrupted cutting
 ✕ : Heavy interrupted cutting

RN



Round,
with hole

		Ceramic										Dimension (in)						
Application	Chipbreaker	Designation		Inch		Metric												
		LX10	LX11												RE	IC	S	D1
-	RNGA 43	RNGA120400	● ▲												-	0.500	0.187	0.203

● : Line up
 ▲ : To be discontinued

RN



Round,
without hole

		Ceramic										Dimension (in)						
Application	Chipbreaker	Designation		Inch		Metric												
		LX10	LX11												RE	IC	S	D1
-	RNGN 43	RNGN120400	● ▲												-	0.500	0.187	-
	RNGN 45	RNGN120700	● ▲												-	0.500	0.313	-

● : Line up
 ▲ : To be discontinued

Insert NEGATIVE TYPE

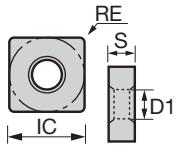
● : Continuous cutting
 ▲ : Light interrupted cutting
 ■ : Heavy interrupted cutting

SN



Square, 90°
with hole

P	Steel																									
M	Stainless																									
K	Cast iron																									
N	Non-ferrous																									
S	Superalloy																									
H	Hard material																									
●●●●●																										



Application	Chipbreaker	Designation	Inch	Metric	Ceramic	RE	IC	S	D1
	-	SNGA 431	SNGA120404	●▲					
		SNGA 432	SNGA120408	●▲					
		SNGA 433	SNGA120412	●▲●					
		SNGA 434	SNGA120416	●▲					

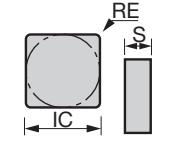
Finishing to medium cutting

SN



Square, 90°
without hole

P	Steel																									
M	Stainless																									
K	Cast iron																									
N	Non-ferrous																									
S	Superalloy																									
H	Hard material																									
●●●●●																										



Application	Chipbreaker	Designation	Inch	Metric	Ceramic	RE	IC	S	D1
	-	SNGN 322	SNGN090308	●▲●					
		SNGN 421	SNGN120304	●▲					
		SNGN 431	SNGN120404	●▲					
		SNGN 432	SNGN120408	●▲●					
		SNGN 433	SNGN120412	●▲●					
		SNGN 434	SNGN120416	●▲●					
		SNGN 435	SNGN120420	●●					
		SNGN 452	SNGN120708	●▲					
		SNGN 453	SNGN120712	●▲					
		SNGN 454	SNGN120716	●▲					

Finishing to medium cutting

● : Line up
 ▲ : To be discontinued

Insert NEGATIVE TYPE

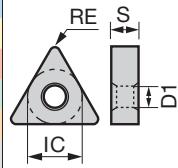
● : Continuous cutting
■ : Light interrupted cutting
✖ : Heavy interrupted cutting

TN



Triangular, 60°
with hole

P	Steel																											
M	Stainless																											
K	Cast iron																											
N	Non-ferrous																											
S	Superalloy																											
H	Hard material																											
●●●●●																												



Application	Chipbreaker	Designation		Ceramic											Dimension (in)				
		Inch	Metric		LX10	LX11	LX21					RE	IC	S	D1				
Finishing to medium cutting		TNGA 330.5	TNGA160402	●▲												0.008	0.375	0.187	0.150
		TNGA 331	TNGA160404	●▲●												0.016	0.375	0.187	0.150
		TNGA 332	TNGA160408	●▲●												0.031	0.375	0.187	0.150
		TNGA 333	TNGA160412	●▲●												0.047	0.375	0.187	0.150
		TNGA 334	TNGA160416	●▲												0.063	0.375	0.187	0.150

● : Line up

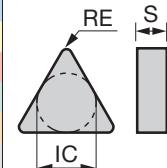
▲ : To be discontinued

TN



Triangular, 60°
without hole

P	Steel																											
M	Stainless																											
K	Cast iron																											
N	Non-ferrous																											
S	Superalloy																											
H	Hard material																											
●●●●●																												



Application	Chipbreaker	Designation		Ceramic											Dimension (in)				
		Inch	Metric		LX10	LX11	LX21					RE	IC	S	D1				
Finishing to medium cutting		TNGN 331	TNGN160404	●▲●												0.016	0.375	0.187	-
		TNGN 332	TNGN160408	●▲●												0.031	0.375	0.187	-
		TNGN 333	TNGN160412	●▲●												0.047	0.375	0.187	-
		TNGN 334	TNGN160416	●▲												0.063	0.375	0.187	-
		TNGN 352	TNGN160708	●▲												0.031	0.375	0.313	-

● : Line up

▲ : To be discontinued

Insert NEGATIVE TYPE

● : Continuous cutting
 ▲ : Light interrupted cutting
 × : Heavy interrupted cutting

VN



		Ceramic						Dimension (in)			
Application	Chipbreaker	Designation		LX10	LX11	LX21	RE IC S D1				
		Inch	Metric								
-	VN	VNGA 331	VNGA160404	●▲							0.016 0.375 0.187 0.150
-	VN	VNGA 332	VNGA160408	●▲●							0.031 0.375 0.187 0.150

● : Line up
 ▲ : To be discontinued

WN



		Ceramic						Dimension (in)			
Application	Chipbreaker	Designation		LX10	LX11	RE IC S D1					
		Inch	Metric								
-	WN	WNGA 431	WNGA080404	●▲							0.016 0.500 0.187 0.203
-	WN	WNGA 432	WNGA080408	●▲							0.031 0.500 0.187 0.203
-	WN	WNGA 433	WNGA080412	●▲							0.047 0.500 0.187 0.203

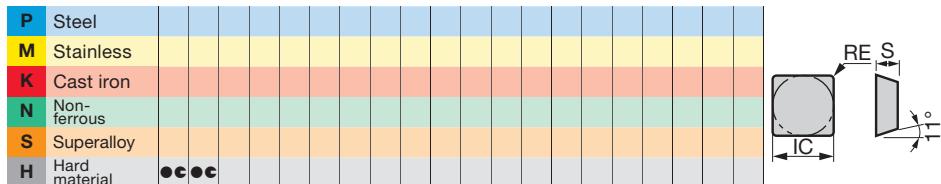
● : Line up
 ▲ : To be discontinued

● : Continuous cutting
 ▲ : Light interrupted cutting
 ■ : Heavy interrupted cutting

Insert POSITIVE TYPE

SP

Square, 90°
without hole
Positive 11°

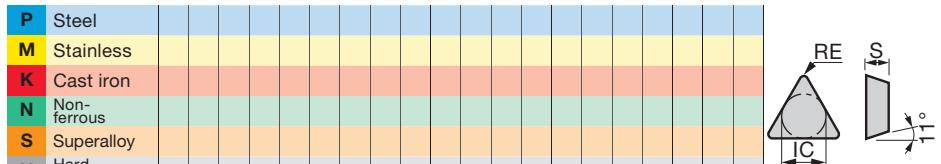


Application	Chipbreaker	Designation	Ceramic												Dimension (in)			
			Inch		Metric		LX10	LX11							RE	IC	S	D1
Finishing to medium cutting	-	SPGN 322	SPGN090308	●▲											0.031	0.375	0.125	-
		SPGN 324	SPGN090316	●▲											0.063	0.375	0.125	-
		SPGN 421	SPGN120304	●▲											0.016	0.500	0.125	-
		SPGN 422	SPGN120308	●▲											0.031	0.500	0.125	-
		SPGN 423	SPGN120312	●▲											0.047	0.500	0.125	-

● : Line up
 ▲ : To be discontinued

TP

Triangular, 60°
without hole
Positive 11°



Application	Chipbreaker	Designation	Ceramic												Dimension (in)			
			Inch		Metric		LX10	LX11	LX21							RE	IC	S
Finishing to medium cutting	-	TPGN 221	TPGN110304	●▲●											0.016	0.250	0.125	-
		TPGN 222	TPGN110308	●▲											0.031	0.250	0.125	-
		TPGN 321	TPGN160304	●▲											0.016	0.375	0.125	-
		TPGN 322	TPGN160308	●▲											0.031	0.375	0.125	-
		TPGN 323	TPGN160312	●▲											0.047	0.375	0.125	-

● : Line up
 ▲ : To be discontinued

PRACTICAL EXAMPLES

Workpiece type	Guide pin	Housing
Insert	DNGA 432	TNGA 333
Grade	LX10	LX10
Toolholder	ADJNR164-A	A20-ATFNL3-D25
	D2 tool steel (60 HRC)	5115 (54 HRC)
Workpiece material		
Cutting conditions	<p>Cutting speed: V_c (sfm) 394</p> <p>Feed : f (ipr) 0.008</p> <p>Depth of cut : ap (in) 0.039</p> <p>Machining External turning</p> <p>Coolant Wet</p>	<p>262</p> <p>0.008</p> <p>0.012</p> <p>Internal turning</p> <p>Wet</p>
Results	<p>tool life (pcs/corner)</p> <p>LX10 Competitor</p> <p>Tool life 2 times!</p>	<p>tool life (pcs/corner)</p> <p>LX10 Competitor (CBN)</p> <p>Tool life 1.3 times!</p>
	<p>With excellent fracture and wear resistance, LX10 provided double tool life at 0.039" d.o.c.</p>	



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Jan. 2022 (TJ)