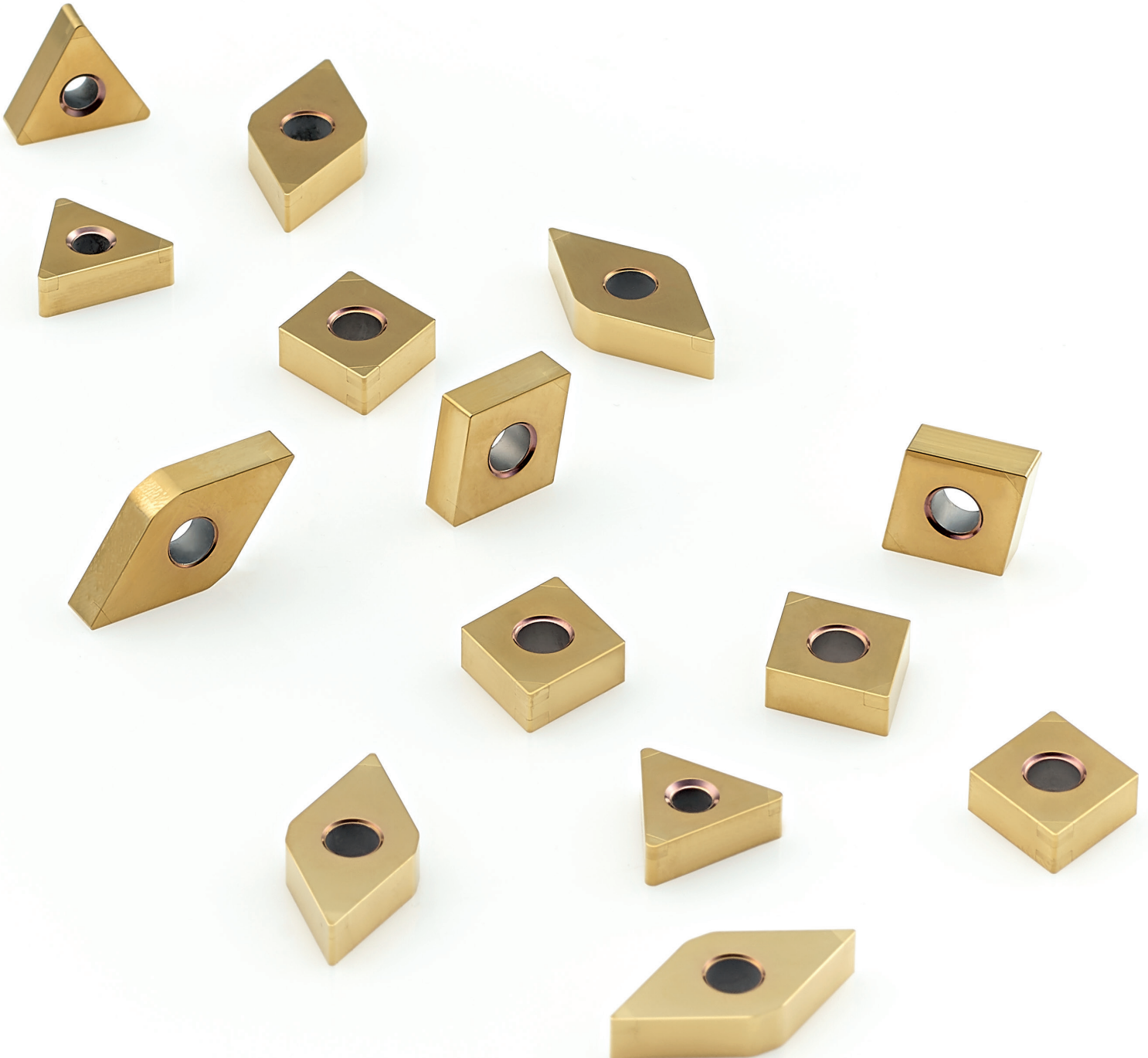


Complete range on PCBN turning inserts



PCBN
Turning

NEW

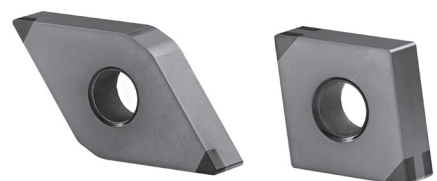


100
YEARS
SINCE 1916

PCBN (Polycrystalline-Cubic-Boron-Nitride) is not found in nature, it is a synthetic material which is a result of an high temperature and pressure process. When PCBN tips are brazed to a carbide insert a powerful cutting tool is born. PCBN insert excel in the finishing and semi-finishing process of hardened steels (45-68 HRC) as well as hard cast iron and heat-resistant super alloys (HRSA).

Grades description:

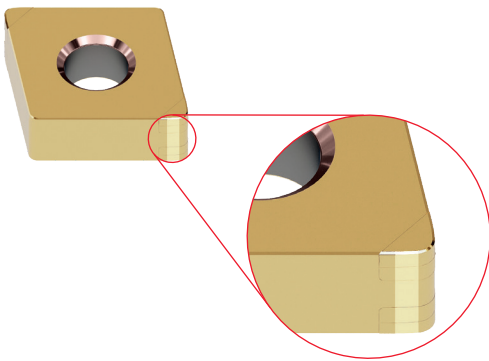
Grade	Code	Characteristics	Application
PBY603	Y5	Low PCBN content grade with medium grain size and ceramic binder. Great wear and abrasion resistance	<ul style="list-style-type: none"> • For continuously and lightly interrupted cutting of Hardened Steel (H01-H10); • Finishing abrasive high strength cast irons; • Can also be used to machine HRSA (S10).
PBY620	Y4	Low PCBN content grade with medium grain size which provides enhanced crater and flank wear resistance with an excellent balance of toughness	<ul style="list-style-type: none"> • For moderately to heavily interrupted turning of all hardened steels (H10-H20).
PBH920	S4	High PCBN with excellent abrasion resistance.	<ul style="list-style-type: none"> • For machining all types of cast iron (K01-K30); • First choice for machining ferrous powder metals; • Can also be used to machine HRSA (S20-S30).



The insert geometry and edge preparation are extremely important in hard part turning as they have a significant influence on tool life and productivity. Palbit product range includes standard and wipers inserts. The standard nose radius generates the lowest cutting forces and has the lowest stability requirements while wipers give an unbeatable combination of high productivity and excellent surface finish.

A large nose radius provides a greater edge strength and therefore extended tool life. For this reason, it is advised to use the largest and allowed nose radius to each process requirements.

WIPER INSERT || Pastilha wiper | Plaquita wiper



Wiper inserts provide two possibilities for process improvement:

- Improved surface finish with standard cutting data;
- Maintained surface finish at substantially higher feed rate.

	Standard ($r_{\epsilon} = 0,8\text{mm}$)	Wiper ($r_{\epsilon} = 0,8\text{mm}$)
Insert type		
Surface Roughness (R_a)	0,81 μm	0,42 μm

Note:

This values were achieved with the next cutting conditions:

H Steel HRC60 | $V_c = 130 \text{ m/min}$ | $f_n = 0,12 \text{ mm/rev}$ | $a_p = 0,2 \text{ mm}$ | $\lambda = 2,5 \text{ mm}$ / ISO 4287

FORMULAS FOR SURFACE ROUGHNESS CALCULATION

Fórmulas para calculo da rugosidade da superfície | Fórmulas para calcular la rugosidad de la superficie

$$R_a = 0,032 \times \frac{f_n^2}{r_{\epsilon}} \times 1000 \text{ } \mu\text{m}$$

$$R_t = 3,91 \times R_a \text{ } \mu\text{m}$$

R_a - Mean Surface Roughness (μm)

R_t - Roughness Total Height (μm)

f_n - Feed Rate (mm/rev)

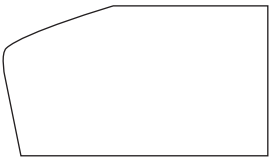
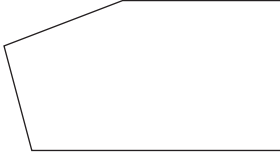

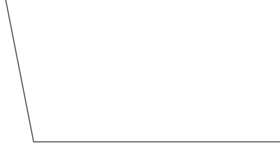
r_{ϵ} - Insert Radius (mm)

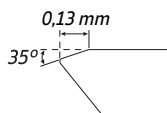
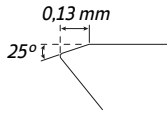
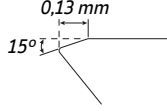
EDGE PREPARATION SELECTION

Seleção da preparação de aresta | Selección de la preparación de arista

The most important criteria for the stability and cutting edge tool-life is to define the correct cutting edge preparation. Its choice is mainly required in order to achieve the best economical result.

Edge preparation:

+ ↑ Cutting forces Edge strength ↓ -	S-Land 	S – Preparation with chamfer and honing - Standard <ul style="list-style-type: none"> - First choice for hard part turning; - Stronger edge than T-land, with more resistance to chipping and fracture, resulting in more predictable tool life; - Generates consistent surface finish; - Critical in interrupted cutting and when using large depth of cut; - Feed rate must be greater than hone size.
	T-Land 	T – Preparation with chamfer <ul style="list-style-type: none"> - T-land is a common edge preparation for PCBN; - Preferred choice for cast iron; - Good alternative to S-land in hard part turning when reduced cutting forces and tighter tolerances are required.
	E-Land 	E – Preparation with edge honing <ul style="list-style-type: none"> - Recommended for HRSA finishing operation; - Honing helps strengthen the edge, giving resistance to chipping and fracturing; - Feed rates must be greater than the hone size to allow actual cutting action to take place and prevent rubbing.
	F-Land 	F – Preparation without honing <ul style="list-style-type: none"> - Sharp cutting edge; - F - Standard is a common edge preparation for PCD; - Recommended for aluminium or other non-ferrous materials.

Honing Types	Specifications
S3513 For interrupted machining	
S2513 For general purpose machining	
S1513 For stable continuous machining	

Note: Based on our experience sometimes it is necessary to define edge preparation during several tests to provide the best possible solution for each application.

CHIP-BREAKER TAILOR-MADE

Quebra- aparos personalizados | Rompevirutas personalizados

Our laser machining and grinding machining technology can reach a wide range of tailor-made solutions. The chip-breakers can be customized according to our customer's needs and still remain with a high cutting edge quality.

PCBN RECOMMENDED CUTTING DATA

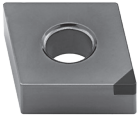
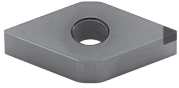

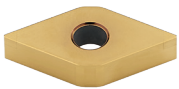


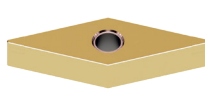
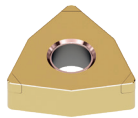
Condições de corte recomendadas para PCBN | Datos de corte recomendadas para PCBN

Workpiece material	Recommend grade for PCBN			VC (m/min)	
	PBH920	PBY603	PBY620		
Hardened Steel (HRC 45-68) Tool-Steel, Case Hardened Steel, Continuous Cut (high Economy without Coolants)		⊗		Semi-finish	80 - 200
				Finish	80 - 180
Hardened Steel (HRC 45-68) Tool-Steel, Case Hardened Steel, Interrupted Cut (recommended without Coolants)	○		⊗	Semi-finish	70 - 180
				Finish	70 - 160
Grey Cast Iron	⊗			Semi-finish	500 - 1000
				Finish	600 - 2000
High Temperature Alloys (Inconel, Waspoly, Hasteloy) Exotic and High Nickel + Cobalt basis	⊗	⊗		Finish	50 - 300

⊗ Recommended ○ Second choice

NEGATIVE INSERTS OVERVIEW

Vista genérica pastilhas negativas | Visión general de plaquitas negativas

SINGLE TIP	CNGA Z1	DNGA Z1				
						
	Size 12	Size 15				
	Page 08					
MULTIPLE TIPS	CNGA Z2 Z4	DNGA Z2 Z4	SNGA Z4	TNGA Z3 Z6	VNGA Z2	WNGA Z3 Z6
						
	Size 12	Size 15	Size 12	Size 16	Size 16	Size 08
	Page 09	Page 10	Page 11	Page 12	Page 13	Page 13

ISO PCD INSERTS CODE KEY

PCBN

Specifications

Code key

Negative inserts

Positive inserts

H		M	
O		V	
P		W	
S		L	
T		A	
C		B	
D		K	
E		R	
F		X	Special

1- Insert shape symbol

Symbol	m (mm)	d (mm)	s (mm)
A	±0.005	±0.025	±0.025
F	±0.005	±0.013	±0.025
C	±0.013	±0.025	±0.025
H	±0.013	±0.013	±0.025
E	±0.025	±0.025	±0.025
G	±0.025	±0.025	±0.13
J	±0.005	±0.05~±0.13	±0.025
K*	±0.013	±0.05~±0.13	±0.025
L*	±0.025	±0.05~±0.13	±0.025
M*	±0.08~±0.20	±0.05~±0.13	±0.13
N*	±0.08~±0.20	±0.05~±0.13	±0.025
U*	±0.13~±0.38	±0.08~±0.25	±0.13

As a rule, the sides of these inserts are as sintered. Tolerance differs with insert size, for the accuracy of class M, refer to the table on the right.

Triangular inserts with a facet (secondary cutting edge)

Detailed dimension of M class insert Insert height Tolerances (mm)					
Inscribed circle	T	S	C	D	V
6.35	±0.08	-	-	-	-
9.525	±0.08	±0.08	±0.11	±0.10	±0.13
12.70	±0.13	±0.13	±0.13	±0.15	-
15.875	±0.15	±0.15	±0.15	±0.18	-
19.05	±0.15	±0.15	±0.15	±0.18	-
25.40	-	±0.18	-	-	-
31.75	-	±0.25	-	-	-

Inscribed circle Tolerances (mm)					
Inscribed circle	T	S	C	D	V
6.35	±0.05	-	-	-	-
9.525	±0.05	±0.05	±0.05	±0.05	±0.05
12.70	±0.08	±0.08	±0.08	±0.08	±0.08
15.875	±0.10	±0.10	±0.10	±0.10	±0.10
19.05	-	-	-	-	±0.10
25.40	-	±0.13	-	-	±0.10
31.75	-	±0.20	-	-	±0.12

3 - Tolerances symbol

A	B	C	D	E
F	G	N	P	O
				Other clearance angle

2 - Normal clearance symbol

ISO	C	N	G	A
ANSI	C	N	G	A

4 - Insert symbol									
symbol	Type	Hole type	Chipbreaker	Shape	symbol	Type	Hole type	Chipbreaker	Shape
W	with hole	Round hole one countersink (40°-60°)	Without chipbreaker		G	with hole	Round hole	Chipbreaker on both sides	
T			Chipbreaker on one side		N	without hole	-	Without chipbreaker	
A	with hole	Round hole	Without chipbreaker		R	without hole	-	Chipbreaker on one side	
M			Chipbreaker on one side		X		-	-	-

Sistema de codificação para pastilhas de PCBN
Codificación para plaquitas de PCBN

R's	35° V's	55° D's	80° C's	90° S's	60° T's	80° W's	IC		ANSI
							mm	inch	Symbol
-	06	04	-	03	06	02	3,97	5/32	1,20
-	08	05	04	04	08	L3	4,76	3/16	1,50
-	09	06	05	05	09	03	5,56	7/32	1,80
06**	-	-	-	-	-	-	6,00	0,236	
06*	11	07	06	06	11	04	6,35	1/4	2,00
07*	13	09	08	07	13	05	7,94	5/16	2,50
08*	-	-	-	-	-	-	8,00	0,315	
09*	16	11	09	09	16	06	9,525	3/8	3,00
10**	-	-	-	-	-	-	10,00	0,394	
12**	-	-	-	-	-	-	12,00	0,472	
12*	22	15	12	12	22	08	12,70	1/2	4,00
15*	27	19	16	15	27	10	15,875	5/8	5,00
16**	-	-	-	-	-	-	16,00	0,63	
19*	33	23	19	19	33	13	19,05	3/4	6,00
20**	-	-	-	-	-	-	20,00	0,787	
25**	-	-	-	-	-	-	25,00	0,984	
25*	44	31	25	25	44	17	25,40	1,00	8,00
31*	54	38	32	31	54	21	31,75	1 1/4	10,00
32**	-	-	-	-	-	-	32,00	1,26	

* ANSI designation only
(Radius Designation is R0)

** Metric designation only
(Radius Designation is M0)

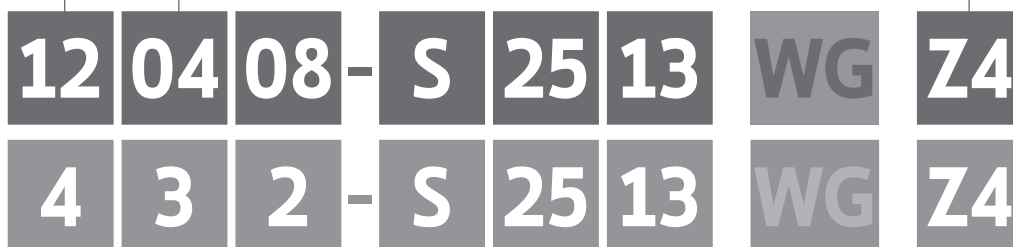
According to International Standard ISO 1832 - 2012(E)

"Indexable inserts for cutting tools - Designation"

ISO	mm	ANSI	inch
01	1.59	1	0.062
T1	1.98	1.2	0.078
02	2.38	1.5	0.094
03	3.18	2	0.125
T3	3.97	2.5	0.156
04	4.76	3	0.188
05	5.56	3.5	0.219
06	6.35	4	0.250
07	7.94	5	0.312
09	9.52	6	0.375
12	12.70	8	0.500

5 - Insert size symbol

6 - Insert thickness symbol



12 - Tip type	
Z1 (1 tip)	Z6 (6 tips)
Z2 (2 tips)	Z8 (8 tips)
Z3 (3 tips)	FL (Full edge left)
Z4 (4 tips)	FR (Full edge right)
Z5 (5 tips)	O (other)

*11 - Wiper	
WG	General Wiper

*Used only when required

7 - Insert corner symbol			
ISO	mm	inch	ANSI
00	Sharp nose		0
01	0.10	.004	0.2
02	0.20	.008	0.5
04	0.40	.015	1
08	0.80	.032	2
12	1.2	.047	3
16	1.6	.062	4
20	2.0	.078	5
24	2.4	.094	6
28	2.8	.109	7
32	3.2	.125	8
00 (inch or M0/metric)	Round insert		0

8 - Cutting edge information		
Shape	Honing	Symbol
	No honing	F
	With honing	E
	Chamfered No honing	T
	Chamfered with honing	S

9 - Angle of Chamfer	
	α
05	05°
10	10°
15	15°
20	20°
25	25°
30	30°
35	35°

10 - Width of Chamfer	
05	0,05 mm
10	0,10 mm
13	0,13 mm
15	0,15 mm
20	0,20 mm
25	0,25 mm
30	0,30 mm
35	0,35 mm
40	0,40 mm

PCBN

Specifications

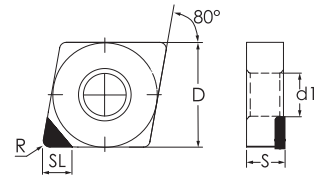
Code key

Negative inserts

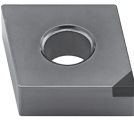
Positive inserts

CN - RHOMBIC 80° NEGATIVE

RÔMBICA 80° NEGATIVA | RÓMBICA 80° NEGATIVA



CNGA Z1

	(1) Geometry code	ISO Reference	ANSI Reference	(2) Grade code			Dimensions Dimensões Dimensiones (mm)						Cutting conditions Condições de corte Condiciones de corte					
				K	H		Z	D	S	R	d1	SL	ap (mm)	Min	Max	fn (mm/r)	Min	Max
				S4	Y5	Y4												
	1124300	CNGA 120404-S2513 Z1	CNGA 431-S2513 Z1	○			1	12,70	4,76	0,40	5,16	2,50	0,15	0,08	0,50	0,08	0,05	0,20
	1124111	CNGA 120408-S2513 Z1	CNGA 432-S2513 Z1	⊗			1	12,70	4,76	0,80	5,16	2,40	0,20	0,08	0,50	0,10	0,08	0,30
	1124301	CNGA 120412-S2513 Z1	CNGA 433-S2513 Z1	○			1	12,70	4,76	1,20	5,16	2,30	0,25	0,08	0,50	0,12	0,08	0,30

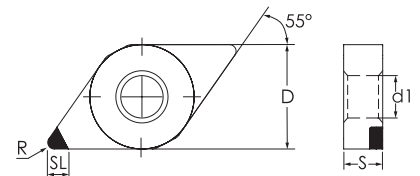
⊗ Stock Items | Itens de stock

○ Available under request | Disponível sob consulta | Disponible bajo consulta

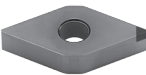
Insert Order Code: ⁽¹⁾Geometry code + ⁽²⁾Grade code

DN - RHOMBIC 55° NEGATIVE

RÔMBICA 55° NEGATIVA | RÓMBICA 55° NEGATIVA



DNGA Z1

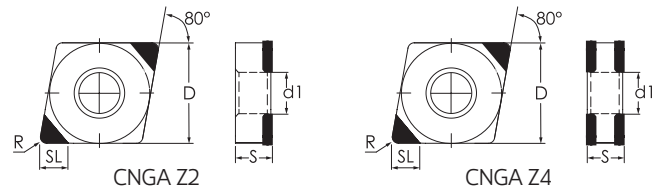
	(1) Geometry code	ISO Reference	ANSI Reference	(2) Grade code			Dimensions Dimensões Dimensiones (mm)						Cutting conditions Condições de corte Condiciones de corte					
				K	H		Z	D	S	R	d1	SL	ap (mm)	Min	Max	fn (mm/r)	Min	Max
				S4	Y5	Y4												
	1124306	DNGA 150404-S2513 Z1	DNGA 431-S2513 Z1	○		○	1	12,70	4,76	0,40	5,16	2,50	0,15	0,08	0,50	0,08	0,05	0,20
	1124112	DNGA 150408-S2513 Z1	DNGA 432-S2513 Z1	⊗		○	1	12,70	4,76	0,80	5,16	2,50	0,20	0,08	0,50	0,10	0,08	0,30
	1124536	DNGA 150412-S2513 Z1	DNGA 433-S2513 Z1	○		○	1	12,70	4,76	1,20	5,16	2,20	0,25	0,08	0,50	0,12	0,08	0,30

⊗ Stock Items | Itens de stock

○ Available under request | Disponível sob consulta | Disponible bajo consulta

Insert Order Code: ⁽¹⁾Geometry code + ⁽²⁾Grade code

CN - RHOMBIC 80° NEGATIVE
RÔMBICA 80° NEGATIVA | RÓMBICA 80° NEGATIVA



CNGA Z2 | CNGA Z4

	⁽¹⁾ Geometry code	⁽²⁾ Grade code			Dimensions Dimensões Dimensiones (mm)							Cutting conditions Condições de corte Condiciones de corte						
		ISO Reference	ANSI Reference	K H			Z	D	S	R	d1	SL	ap (mm)	Min	Max	fn (mm/r)	Min	Max
				S4	Y5	Y4												
	1124344	CNGA 120404-S2513 Z2	CNGA 431-S2513 Z2	⊗	⊗	⊗	2	12,70	4,76	0,40	5,16	2,50	0,15	0,08	0,50	0,08	0,05	0,20
	1124175	CNGA 120408-S2513 Z2	CNGA 432-S2513 Z2	⊗	⊗	⊗	2	12,70	4,76	0,80	5,16	2,40	0,20	0,08	0,50	0,10	0,08	0,30
	1124568	CNGA 120408-S3513 Z2	CNGA 432-S3513 Z2			○	2	12,70	4,76	0,80	5,16	2,40	0,20	0,08	0,50	0,10	0,08	0,30
	1124468	CNGA 120412-S2513 Z2	CNGA 433-S2513 Z2	⊗	⊗	⊗	2	12,70	4,76	1,20	5,16	2,30	0,25	0,08	0,50	0,12	0,08	0,30
	1124569	CNGA 120412-S3513 Z2	CNGA 433-S3513 Z2			○	2	12,70	4,76	1,20	5,16	2,30	0,25	0,08	0,50	0,12	0,08	0,30
	1124474	CNGA 120404-S2513 Z4	CNGA 431-S2513 Z4		⊗	○	4	12,70	4,76	0,40	5,16	2,50	0,15	0,08	0,50	0,08	0,05	0,20
	1124134	CNGA 120408-S2513 Z4	CNGA 432-S2513 Z4		⊗	○	4	12,70	4,76	0,80	5,16	2,40	0,20	0,08	0,50	0,10	0,08	0,30
	1124570	CNGA 120408-S3513 Z4	CNGA 432-S3513 Z4			○	4	12,70	4,76	0,80	5,16	2,40	0,20	0,08	0,50	0,10	0,08	0,30
	1124475	CNGA 120412-S2513 Z4	CNGA 433-S2513 Z4		⊗	○	4	12,70	4,76	1,20	5,16	2,30	0,25	0,08	0,50	0,12	0,08	0,30
	1124571	CNGA 120412-S3513 Z4	CNGA 433-S3513 Z4			○	4	12,70	4,76	1,20	5,16	2,30	0,25	0,08	0,50	0,12	0,08	0,30
	1124534	CNGA 120404-S1513 WG Z4	CNGA 431-S1513 WG Z4		○	○	4	12,70	4,76	0,40	5,16	2,40	0,15	0,08	0,50	0,08	0,05	0,20
	1124535	CNGA 120404-S2513 WG Z4	CNGA 431-S2513 WG Z4		○	○	4	12,70	4,76	0,40	5,16	2,40	0,15	0,08	0,50	0,08	0,05	0,20
	1124517	CNGA 120408-S1513 WG Z4	CNGA 432-S1513 WG Z4		⊗	○	4	12,70	4,76	0,80	5,16	2,40	0,20	0,08	0,50	0,10	0,08	0,30
	1124518	CNGA 120408-S2513 WG Z4	CNGA 432-S2513 WG Z4		○	⊗	4	12,70	4,76	0,80	5,16	2,40	0,20	0,08	0,50	0,10	0,08	0,30

⊗ Stock items | Itens de stock

○ Available under request | Disponível sob consulta | Disponible bajo consulta

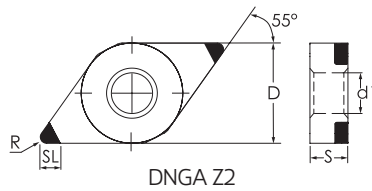
Insert Order Code: ⁽¹⁾Geometry code + ⁽²⁾Grade code

NEGATIVE INSERTS

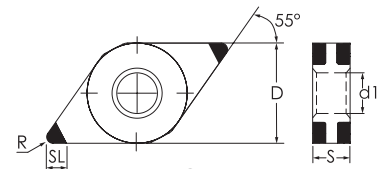
MULTIPLE TIPS

DN - RHOMBIC 55° NEGATIVE

RÔMBICA 55° NEGATIVA | RÓMBICA 55° NEGATIVA


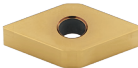


DNGA Z2



DNGA Z4

DNGA Z2 | DNGA Z4

	(1) Geometry code	(2) Grade code			Dimensions Dimensões Dimensiones (mm)							Cutting conditions Condições de corte Condiciones de corte						
		ISO Reference	ANSI Reference	K	H		Z	D	S	R	d1	SL	ap (mm)	Min	Max	fn (mm/r)	Min	Max
				S4	Y5	Y4												
	1124482	DNGA 150404-S2513 Z2	DNGA 431-S2513 Z2	⊗	⊗	2	12,70	4,76	0,40	5,16	2,50	0,15	0,08	0,50	0,08	0,05	0,20	
	1124483	DNGA 150408-S2513 Z2	DNGA 432-S2513 Z2	⊗	⊗	2	12,70	4,76	0,80	5,16	2,10	0,20	0,08	0,50	0,10	0,08	0,30	
	1124537	DNGA 150412-S2513 Z2	DNGA 433-S2513 Z2	○	○	2	12,70	4,76	1,20	5,16	2,20	0,25	0,08	0,50	0,12	0,08	0,30	
	1124348	DNGA 150604-S2513 Z2	DNGA 441-S2513 Z2	⊗	⊗	2	12,70	6,35	0,40	5,16	2,50	0,15	0,08	0,50	0,08	0,05	0,20	
	1124177	DNGA 150608-S2513 Z2	DNGA 442-S2513 Z2	⊗	⊗	2	12,70	6,35	0,80	5,16	2,10	0,20	0,08	0,50	0,10	0,08	0,30	
	1124572	DNGA 150608-S3513 Z2	DNGA 442-S3513 Z2	○	○	2	12,70	6,35	0,80	5,16	2,10	0,20	0,08	0,50	0,10	0,08	0,30	
	1124377	DNGA 150612-S2513 Z2	DNGA 443-S2513 Z2	⊗	⊗	2	12,70	6,35	1,20	5,16	2,00	0,25	0,08	0,50	0,12	0,08	0,30	
	1124573	DNGA 150612-S3513 Z2	DNGA 443-S3513 Z2	○	○	2	12,70	6,35	1,20	5,16	2,00	0,25	0,08	0,50	0,12	0,08	0,30	
	1124479	DNGA 150604-S2513 Z4	DNGA 441-S2513 Z4	⊗	⊗	4	12,70	6,35	0,40	5,16	2,50	0,15	0,08	0,50	0,08	0,05	0,20	
	1124133	DNGA 150608-S2513 Z4	DNGA 442-S2513 Z4	⊗	⊗	4	12,70	6,35	0,80	5,16	2,10	0,20	0,08	0,50	0,10	0,08	0,30	
	1124575	DNGA 150608-S3513 Z4	DNGA 442-S3513 Z4	○	○	4	12,70	6,35	0,80	5,16	2,10	0,20	0,08	0,50	0,10	0,08	0,30	
	1124480	DNGA 150612-S2513 Z4	DNGA 443-S2513 Z4	⊗	⊗	4	12,70	6,35	1,20	5,16	2,00	0,25	0,08	0,50	0,12	0,08	0,30	
	1124576	DNGA 150612-S3513 Z4	DNGA 443-S3513 Z4	○	○	4	12,70	6,35	1,20	5,16	2,00	0,25	0,08	0,50	0,12	0,08	0,30	

⊗ Stock Items | Itens de stock

○ Available under request | Disponível sob consulta | Disponible bajo consulta

Insert Order Code: (1) Geometry code + (2) Grade code

PCBN

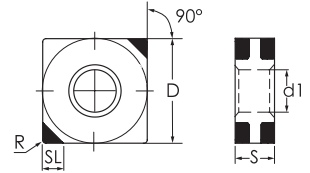
Specifications

Code key

Negative inserts

Positive inserts

SN = SQUARE 90° NEGATIVE
 QUADRADA 90° NEGATIVA | ESQUADRA 90° NEGATIVA



SNGA Z4

	(1) Geometry code	(2) Grade code			K H		Dimensions Dimensões Dimensiones (mm)						Cutting conditions Condições de corte Condiciones de corte					
		ISO Reference	ANSI Reference	S4	Y5	Y4	Z	D	S	R	d1	SL	ap (mm)	Min	Max	fn (mm/r)	Min	Max
				PBH920	PBY603	PBY620												
	1124178	SNGA 120404-S2513 Z4	SNGA 431-S2513 Z4	⊗	○	⊗	4	12,70	4,76	0,40	5,16	2,40	0,15	0,08	0,50	0,08	0,05	0,20
	1124538	SNGA 120404-T2513 Z4	SNGA 431-T2513 Z4	○	○		4	12,70	4,76	0,40	5,16	2,40	0,15	0,08	0,50	0,08	0,05	0,20
	1124354	SNGA 120408-S2513 Z4	SNGA 432-S2513 Z4	⊗	○	⊗	4	12,70	4,76	0,80	5,16	2,00	0,20	0,08	0,50	0,10	0,08	0,30
	1124577	SNGA 120408-S3513 Z4	SNGA 432-S3513 Z4		○		4	12,70	4,76	0,80	5,16	2,00	0,20	0,08	0,50	0,10	0,08	0,30
	1124433	SNGA 120408-T2513 Z4	SNGA 432-T2513 Z4	⊗			4	12,70	4,76	0,80	5,16	2,00	0,20	0,08	0,50	0,10	0,08	0,30
	1124539	SNGA 120412-S2513 Z4	SNGA 433-S2513 Z4		○	⊗	4	12,70	4,76	1,20	5,16	2,30	0,25	0,08	0,50	0,12	0,08	0,30
	1124578	SNGA 120412-S3513 Z4	SNGA 433-S3513 Z4			○	4	12,70	4,76	1,20	5,16	2,30	0,25	0,08	0,50	0,12	0,08	0,30
	1124540	SNGA 120412-T2513 Z4	SNGA 433-T2513 Z4	○			4	12,70	4,76	1,20	5,16	2,30	0,25	0,08	0,50	0,12	0,08	0,30

⊗ Stock Items | Itens de stock

○ Available under request | Disponível sob consulta | Disponible bajo consulta

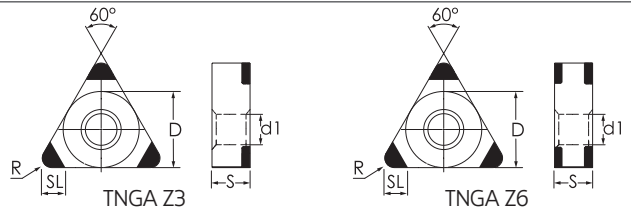
Insert Order Code: (1)Geometry code + (2)Grade code

NEGATIVE INSERTS

TN - TRIANGULAR 60° NEGATIVE

TRIANGULAR 60° NEGATIVA | TRIANGULAR 60° NEGATIVA

TNGA Z3 | TNGA Z6





PCBN

Specifications

Code key

Negative inserts

Positive inserts

	(1) Geometry code	ISO Reference	ANSI Reference	K			H			Dimensions Dimensões Dimensiones (mm)						Cutting conditions Condições de corte Condiciones de corte					
				S4	Y5	Y4															
				PBH920	PBY603	PBY620	Z	D	S	R	d1	SL	ap (mm)	Min	Max	fn (mm/r)	Min	Max			
	1124357	TNGA 160404-S2513 Z3	TNGA 431-S2513 Z3	○	⊗	⊗	3	9,53	4,76	0,40	3,81	2,30	0,15	0,08	0,50	0,08	0,05	0,20			
	1124179	TNGA 160408-S2513 Z3	TNGA 432-S2513 Z3	○	⊗	⊗	3	9,53	4,76	0,80	3,81	2,00	0,20	0,08	0,50	0,10	0,08	0,30			
	1124579	TNGA 160408-S3513 Z3	TNGA 332-S3513 Z3	○		○	3	9,53	4,76	0,80	3,81	2,00	0,20	0,08	0,50	0,10	0,08	0,30			
	1124469	TNGA 160412-S2513 Z3	TNGA 433-S2513 Z3	○	⊗	⊗	3	9,53	4,76	1,20	3,81	2,00	0,25	0,08	0,50	0,12	0,08	0,30			
	1124580	TNGA 160412-S3513 Z3	TNGA 333-S3513 Z3	○		○	3	9,53	4,76	1,20	3,81	2,00	0,25	0,08	0,50	0,12	0,08	0,30			
	1124477	TNGA 160404-S2513 Z6	TNGA 431-S2513 Z6	⊗		○	6	9,53	4,76	0,40	3,81	2,30	0,15	0,08	0,50	0,08	0,05	0,20			
	1124097	TNGA 160408-S2513 Z6	TNGA 432-S2513 Z6	⊗		○	6	9,53	4,76	0,80	3,81	2,00	0,20	0,08	0,50	0,10	0,08	0,30			
	1124581	TNGA 160408-S3513 Z6	TNGA 332-S3513 Z6	⊗		○	6	9,53	4,76	0,80	3,81	2,00	0,20	0,08	0,50	0,10	0,08	0,30			
	1124478	TNGA 160412-S2513 Z6	TNGA 433-S2513 Z6	⊗		○	6	9,53	4,76	1,20	3,81	2,00	0,25	0,08	0,50	0,12	0,08	0,30			
	1124582	TNGA 160412-S3513 Z6	TNGA 333-S3513 Z6	⊗		○	6	9,53	4,76	1,20	3,81	2,00	0,25	0,08	0,50	0,12	0,08	0,30			

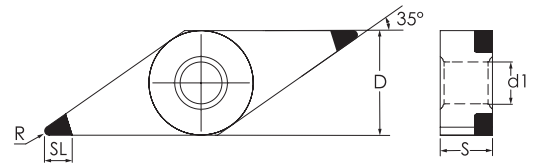
⊗ Stock Items | Itens de stock

○ Available under request | Disponível sob consulta | Disponible bajo consulta

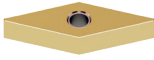
Insert Order Code: (1) Geometry code + (2) Grade code

VN - RHOMBIC 35° NEGATIVE

RÔMBICA 35° NEGATIVA | RÓMBICA 35° NEGATIVA



VNGA Z2

	(1) Geometry code	(2) Grade code		K			H			Dimensions Dimensões Dimensiones (mm)						Cutting conditions Condições de corte Condiciones de corte					
				S4	Y5	Y4															
				PBH920	PBY603	PBY620	Z	D	S	R	d1	SL	ap (mm)	Min	Max	fn (mm/r)	Min	Max			
	1124163	VNGA 160404-S2513 Z2	VNGA 431-S2513 Z2	○	⊗	⊗	2	9,53	4,76	0,80	3,81	2,00	0,15	0,08	0,50	0,08	0,05	0,20			
	1124098	VNGA 160408-S2513 Z2	VNGA 432-S2513 Z2	○	⊗	⊗	2	9,53	4,76	0,40	3,81	2,80	0,20	0,08	0,50	0,10	0,08	0,30			
	1124470	VNGA 160412-S2513 Z2	VNGA 433-S2513 Z2	○	⊗	⊗	2	9,53	4,76	1,20	3,81	1,90	0,25	0,08	0,50	0,12	0,08	0,30			

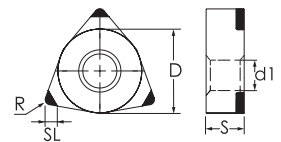
⊗ Stock Items | Itens de stock

○ Available under request | Disponível sob consulta | Disponible bajo consulta

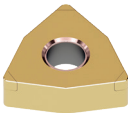
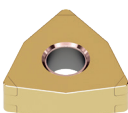
Insert Order Code: (1) Geometry code + (2) Grade code

WN - TRIGON 80° NEGATIVE

TRIGONAL 80° NEGATIVA | TRIGONA 80° NEGATIVA



WNGA Z3 | WNGA Z6

	(1) Geometry code	(2) Grade code		K			H			Dimensions Dimensões Dimensiones (mm)						Cutting conditions Condições de corte Condiciones de corte					
				S4	Y5	Y4															
				PBH920	PBY603	PBY620	Z	D	S	R	d1	SL	ap (mm)	Min	Max	fn (mm/r)	Min	Max			
	1124471	WNGA 080404-S2513 Z3	WNGA 431-S2513 Z3	○	⊗	⊗	3	12,70	4,76	0,40	5,16	2,30	0,15	0,08	0,50	0,08	0,05	0,20			
	1124472	WNGA 080408-S2513 Z3	WNGA 432-S2513 Z3	○	⊗	⊗	3	12,70	4,76	0,80	5,16	2,00	0,20	0,08	0,50	0,10	0,08	0,30			
	1124583	WNGA 080408-S3513 Z3	WNGA 432-S3513 Z3	○		○	3	12,70	4,76	0,80	5,16	2,00	0,20	0,08	0,50	0,10	0,08	0,30			
	1124473	WNGA 080412-S2513 Z3	WNGA 433-S2513 Z3	○	⊗	⊗	3	12,70	4,76	1,20	5,16	2,00	0,25	0,08	0,50	0,12	0,08	0,30			
	1124584	WNGA 080412-S3513 Z3	WNGA 433-S3513 Z3	○		○	3	12,70	4,76	1,20	5,16	2,00	0,25	0,08	0,50	0,12	0,08	0,30			
	1124589	WNGA 080404-S2513 Z6	WNGA 431-S2513 Z6	○	○	○	6	12,70	4,76	1,20	5,16	2,00	0,25	0,08	0,50	0,12	0,08	0,30			
	1124588	WNGA 080408-S2513 Z6	WNGA 432-S2513 Z6	○	○	○	6	12,70	4,76	0,80	5,16	2,00	0,20	0,08	0,50	0,10	0,08	0,30			
	1124585	WNGA 080408-S3513 Z6	WNGA 432-S3513 Z6	○		○	6	12,70	4,76	0,80	5,16	2,00	0,20	0,08	0,50	0,10	0,08	0,30			
	1124587	WNGA 080412-S2513 Z6	WNGA 433-S2513 Z6	○	○	○	6	12,70	4,76	0,40	5,16	2,30	0,15	0,08	0,50	0,08	0,05	0,20			
	1124586	WNGA 080412-S3513 Z6	WNGA 433-S3513 Z6	○		○	6	12,70	4,76	1,20	5,16	2,00	0,25	0,08	0,50	0,12	0,08	0,30			



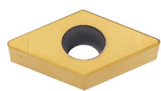

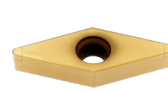
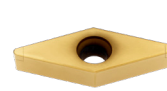
⊗ Stock Items | Itens de stock

○ Available under request | Disponível sob consulta | Disponible bajo consulta

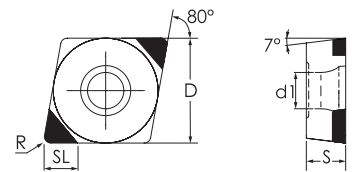
Insert Order Code: (1) Geometry code + (2) Grade code

POSITIVE INSERTS OVERVIEW

Vista genérica pastilhas positivas | Visión general de plaquitas positivas

SINGLE TIP	TPGW Z1				
					
	Size 11 Page 16				
MULTIPLE TIPS	CCGW Z2	DCGW Z2	TPGW Z3	VBGW Z2	VVGW Z2
					
	Size 06-09	Size 07-11	Size 09-11	Size 11-16	Size 16
	Page 14	Page 15	Page 16	Page 17	Page 17

CC - RHOMBIC 80° POSITIVE
RÔMBICA 80° POSITIVA | RÓMBICA 80° POSITIVA



CCGW Z2

Code Key	(1) Geometry code	(2) Grade code		H		Dimensions / Dimensões / Dimensiones (mm)						Cutting conditions / Condições de corte / Condiciones de corte					
		ISO Reference	ANSI Reference	Y5	Y4	Z	D	S	R	d1	SL	ap (mm)	Min	Max	fn (mm/r)	Min	Max
				PBY603	PBY620												
	1124635	CCGW 060202-S2513 Z2	CCGW 21.50.5-S2513 Z2	⊗	⊗	2	6,35	2,38	0,2	2,8	2,4	0,15	0,05	0,4	0,08	0,05	0,2
	1124555	CCGW 060204-S2513 Z2	CCGW 21.51-S2513 Z2	⊗	⊗	2	6,35	2,38	0,4	2,8	2	0,15	0,05	0,45	0,08	0,05	0,25
	1124636	CCGW 060208-S2513 Z2	CCGW 21.52-S2513 Z2	⊗	⊗	2	6,35	2,38	0,8	2,8	2,4	0,2	0,08	0,45	0,1	0,08	0,3
	1124638	CCGW 09T302-S2513 Z2	CCGW 32.50.5-S2513 Z2	⊗	⊗	2	9,53	3,97	0,2	4,4	2,5	0,15	0,05	0,45	0,08	0,05	0,2
	1124640	CCGW 09T304-S2513 Z2	CCGW 32.51-S2513 Z2	⊗	⊗	2	9,53	3,97	0,4	4,4	2,5	0,2	0,08	0,45	0,1	0,05	0,25
	1124632	CCGW 09T308-S2513 Z2	CCGW 32.52-S2513 Z2	○	○	2	9,53	3,97	0,8	4,4	2,5	0,2	0,08	0,45	0,1	0,08	0,3
	1124637	CCGW 09T302-S2513 WG Z2	CCGW 32.50.5-S2513 WG Z2	⊗	○	2	9,53	3,97	0,2	4,4	2,4	0,15	0,05	0,45	0,08	0,05	0,2
	1124639	CCGW 09T304-S2513 WG Z2	CCGW 32.51-S2513 WG Z2	○	⊗	2	9,53	3,97	0,4	4,4	2,4	0,2	0,08	0,45	0,1	0,05	0,25
	1124641	CCGW 09T308-S2513 WG Z2	CCGW 32.52-S2513 WG Z2	⊗	⊗	2	9,53	3,97	0,8	4,4	2,4	0,2	0,08	0,45	0,1	0,08	0,3
	1124605	CCGW 060202-S1513 Z2	CCGW 21.50.5-S1513 Z2	⊗	⊗	2	6,35	2,38	0,2	2,8	2	0,15	0,05	0,4	0,08	0,05	0,2
	1124606	CCGW 060204-S1513 Z2	CCGW 21.51-S1513 Z2	⊗	⊗	2	6,35	2,38	0,4	2,8	2	0,15	0,05	0,45	0,08	0,05	0,25
	1124607	CCGW 060208-S1513 Z2	CCGW 21.52-S1513 Z2	⊗	⊗	2	6,35	2,38	0,8	2,8	2	0,2	0,08	0,45	0,1	0,08	0,3
	1124608	CCGW 09T302-S1513 Z2	CCGW 32.50.5-S1513 Z2	⊗	⊗	2	9,53	3,97	0,2	4,4	2	0,15	0,05	0,45	0,08	0,05	0,2
	1124609	CCGW 09T304-S1513 Z2	CCGW 32.51-S1513 Z2	⊗	⊗	2	9,53	3,97	0,4	4,4	2	0,2	0,08	0,45	0,1	0,05	0,25
	1124610	CCGW 09T308-S1513 Z2	CCGW 32.52-S1513 Z2	⊗	⊗	2	9,53	3,97	0,8	4,4	2	0,2	0,08	0,45	0,1	0,08	0,3

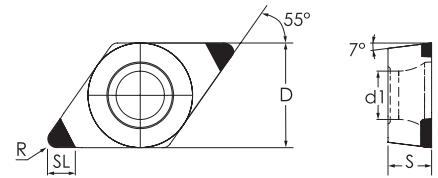
⊗ Stock Items | Itens de stock

○ Available under request | Disponível sob consulta | Disponible bajo consulta

Insert Order Code: (1) Geometry code + (2) Grade code

DC = RHOMBIC 55° POSITIVE

RÔMBICA 55° POSITIVA | RÓMBICA 55° POSITIVA



DCGW Z2

	(1) Geometry code	(2) Grade code		H		Dimensions Dimensões Dimensiones (mm)						Cutting conditions Condições de corte Condiciones de corte					
				Y5	Y4	Z	D	S	R	d1	SL	ap (mm)	Min	Max	fn (mm/r)	Min	Max
				PBY603	PBY620												
	1124611	DCGW 070202-S2513 Z2	DCGW 21.50.5-S2513 Z2	⊗	⊗	2	6,35	2,38	0,2	2,8	2	0,15	0,08	0,4	0,08	0,05	0,2
	1124436	DCGW 070204-S2513 Z2	DCGW 21.51-S2513 Z2	⊗	⊗	2	6,35	2,38	0,4	2,8	2,4	0,15	0,08	0,4	0,08	0,05	0,25
	1124612	DCGW 070208-S2513 Z2	DCGW 21.52-S2513 Z2	⊗	⊗	2	6,35	2,38	0,8	2,8	2,5	0,2	0,08	0,45	0,1	0,08	0,3
	1124613	DCGW 11T302-S2513 Z2	DCGW 32.50.5-S2513 Z2	⊗	⊗	2	9,53	3,97	0,2	4,4	2,7	0,15	0,08	0,45	0,08	0,05	0,2
	1124554	DCGW 11T304-S2513 Z2	DCGW 32.51-S2513 Z2	⊗	⊗	2	9,53	3,97	0,4	4,4	2,5	0,2	0,08	0,45	0,1	0,05	0,25
	1124614	DCGW 11T308-S2513 Z2	DCGW 32.52-S2513 Z2	⊗	⊗	2	9,53	3,97	0,8	4,4	2	0,2	0,08	0,45	0,1	0,08	0,3
	1124642	DCGW 070202-S1513 Z2	DCGW 21.50.5-S1513 Z2	⊗	○	2	6,35	2,38	0,2	2,8	2,5	0,15	0,08	0,4	0,08	0,05	0,2
	1124643	DCGW 070204-S1513 Z2	DCGW 21.51-S1513 Z2	⊗	○	2	6,35	2,38	0,4	2,8	2,5	0,15	0,08	0,4	0,08	0,05	0,25
	1124644	DCGW 070208-S1513 Z2	DCGW 21.52-S1513 Z2	○	○	2	6,35	2,38	0,8	2,8	2	0,2	0,08	0,45	0,1	0,08	0,3
	1124645	DCGW 11T302-S1513 Z2	DCGW 32.50.5-S1513 Z2	⊗	○	2	9,53	3,97	0,2	4,4	2,7	0,15	0,08	0,45	0,08	0,05	0,2
	1124647	DCGW 11T304-S1513 Z2	DCGW 32.51-S1513 Z2	⊗	○	2	9,53	3,97	0,4	4,4	2,5	0,2	0,08	0,45	0,1	0,05	0,25
	1124649	DCGW 11T308-S1513 Z2	DCGW 32.52-S1513 Z2	○	○	2	9,53	3,97	0,8	4,4	2	0,2	0,08	0,45	0,1	0,08	0,3

⊗ Stock Items | Itens de stock

○ Available under request | Disponível sob consulta | Disponible bajo consulta

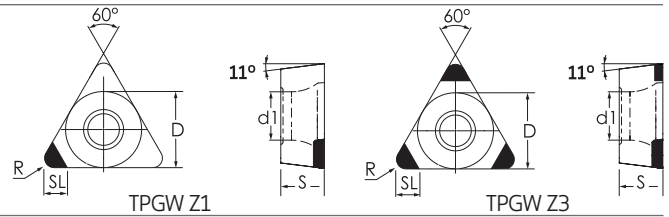
Insert Order Code: (1)Geometry code + (2)Grade code

POSITIVE INSERTS

MULTIPLE TIPS

TP - TRIANGULAR 60° POSITIVE

TRIANGULAR 60° POSITIVA | TRIANGULAR 60° POSITIVA



TPGW Z1 / TPGW Z3

	(1) Geometry code	(2) Grade code		H		Dimensions Dimensões Dimensiones (mm)						Cutting conditions Condições de corte Condiciones de corte					
		ISO Reference	ANSI Reference	Y5	Y4	Z	D	S	R	d1	SL	ap (mm)	Min	Max	fn (mm/r)	Min	Max
				PBY603	PBY620												
	1124657	TPGW 110302-S2513 Z1	TPGW 220.5-S2513 Z1	○	○	1	6,35	2,38	0,2	2,8	2,4	0,15	0,08	0,45	0,08	0,05	0,15
	1124660	TPGW 110304-S2513 Z1	TPGW 221-S2513 Z1	⊗	○	1	6,35	2,38	0,4	2,8	2,3	0,15	0,08	0,45	0,08	0,05	0,2
	1124598	TPGW 110308-S2513 Z1	TPGW 222-S2513 Z1	⊗	⊗	1	6,35	2,38	0,8	2,8	2,4	0,2	0,08	0,45	0,1	0,08	0,2
	1124653	TPGW 090202-S2513 Z3	TPGW 1.81.50.5-S2513 Z3	⊗	○	3	5,56	2,38	0,2	2,5	2,5	0,1	0,05	0,4	0,08	0,05	0,15
	1124655	TPGW 090204-S2513 Z3	TPGW 1.81.51-S2513 Z3	⊗	⊗	3	5,56	2,38	0,4	2,5	2,3	0,15	0,08	0,45	0,08	0,05	0,15
	1124658	TPGW 110302-S2513 Z3	TPGW 220.5-S2513 Z3	⊗	⊗	3	6,35	2,38	0,2	2,8	2,4	0,15	0,08	0,45	0,08	0,05	0,15
	1124661	TPGW 110304-S2513 Z3	TPGW 221-S2513 Z3	⊗	⊗	3	6,35	2,38	0,4	2,8	2,3	0,15	0,08	0,45	0,08	0,05	0,2
	1124663	TPGW 110308-S2513 Z3	TPGW 222-S2513 Z3	○	⊗	3	6,35	2,38	0,8	2,8	2	0,2	0,08	0,45	0,1	0,08	0,2
	1124652	TPGW 090202-S1513 Z3	TPGW 1.81.50.5-S1513 Z3	⊗	○	3	5,56	2,38	0,2	2,5	2,5	0,1	0,08	0,4	0,08	0,05	0,15
	1124654	TPGW 090204-S1513 Z3	TPGW 1.81.51-S1513 Z3	⊗	○	3	5,56	2,38	0,4	2,5	2,3	0,15	0,08	0,45	0,08	0,05	0,15
	1124656	TPGW 110302-S1513 Z3	TPGW 220.5-S1513 Z3	⊗	○	3	6,35	2,38	0,2	2,8	2,4	0,15	0,08	0,45	0,08	0,05	0,15
	1124659	TPGW 110304-S1513 Z3	TPGW 221-S1513 Z3	⊗	○	3	6,35	2,38	0,4	2,8	2,3	0,15	0,08	0,45	0,08	0,05	0,2
	1124662	TPGW 110308-S1513 Z3	TPGW 222-S1513 Z3	○	○	3	6,35	2,38	0,8	2,8	2	0,2	0,08	0,45	0,1	0,08	0,2

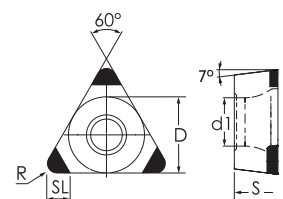
⊗ Stock Items | Itens de stock

○ Available under request | Disponível sob consulta | Disponible bajo consulta

Insert Order Code: (1) Geometry code + (2) Grade code

TC - TRIANGULAR 60° POSITIVE

TRIANGULAR 60° POSITIVA | TRIANGULAR 60° POSITIVA



TCGW Z3

	(1) Geometry code	(2) Grade code		H		Dimensions Dimensões Dimensiones (mm)						Cutting conditions Condições de corte Condiciones de corte					
		ISO Reference	ANSI Reference	Y5	Y4	Z	D	S	R	d1	SL	ap (mm)	Min	Max	fn (mm/r)	Min	Max
				PBY603	PBY620												
	1124434	TCGW 16T304-S2513 Z3	TCGW 32.51-S2513 Z3	⊗	⊗	3	9,53	3,97	0,4	4,4	2,5	0,15	0,08	0,45	0,08	0,05	0,2
	1124651	TCGW 16T308-S2513 Z3	TCGW 32.52-S2513 Z3	⊗	⊗	3	9,53	3,97	0,8	4,4	2	0,2	0,08	0,45	0,1	0,08	0,3

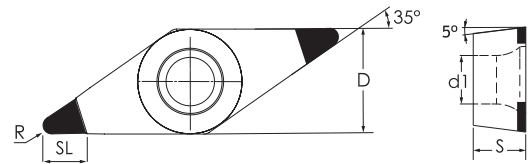
⊗ Stock Items | Itens de stock

○ Available under request | Disponível sob consulta | Disponible bajo consulta


Insert Order Code: (1) Geometry code + (2) Grade code

VB = RHOMBIC 35° POSITIVE

RÔMBICA 35° POSITIVA | RÓMBICA 35° POSITIVA



VBGW Z2

	(1) Geometry code	(2) Grade code		H		Dimensions Dimensões Dimensiones (mm)						Cutting conditions Condições de corte Condiciones de corte					
		ISO Reference	ANSI Reference	Y5	Y4	Z	D	S	R	d1	SL	ap (mm)	Min	Max	fn (mm/r)	Min	Max
				PBY603	PBY620												
	1124664	VBGW 110302-S2513 Z2	VBGW 220.5-S2513 Z2	⊗	⊗	2	6,35	3,18	0,2	2,8	3,2	0,1	0,08	0,4	0,05	0,05	0,15
	1124665	VBGW 110304-S2513 Z2	VBGW 221-S2513 Z2	⊗	⊗	2	6,35	3,18	0,4	2,8	2,8	0,15	0,08	0,45	0,08	0,05	0,2
	1124666	VBGW 110308-S2513 Z2	VBGW 222-S2513 Z2	○	⊗	2	6,35	3,18	0,8	2,8	2	0,15	0,08	0,45	0,1	0,08	0,25
	1124618	VBGW 160402-S2513 Z2	VBGW 330.5-S2513 Z2	⊗	⊗	2	9,53	4,76	0,2	4,4	2	0,1	0,08	0,45	0,08	0,05	0,15
	1124619	VBGW 160404-S2513 Z2	VBGW 331-S2513 Z2	⊗	⊗	2	9,53	4,76	0,4	4,4	2	0,15	0,08	0,45	0,08	0,05	0,2
	1124620	VBGW 160408-S2513 Z2	VBGW 332-S2513 Z2	⊗	⊗	2	9,53	4,76	0,8	4,4	2	0,2	0,08	0,5	0,1	0,08	0,3
	1124621	VBGW 160402-S1513 Z2	VBGW 330.5-S1513 Z2	⊗	⊗	2	9,53	4,76	0,2	4,4	2	0,1	0,08	0,45	0,08	0,05	0,15
	1124622	VBGW 160404-S1513 Z2	VBGW 331-S1513 Z2	⊗	⊗	2	9,53	4,76	0,4	4,4	2	0,15	0,08	0,45	0,08	0,05	0,2
	1124623	VBGW 160408-S1513 Z2	VBGW 332-S1513 Z2	⊗	⊗	2	9,53	4,76	0,8	4,4	2	0,2	0,08	0,5	0,1	0,08	0,3

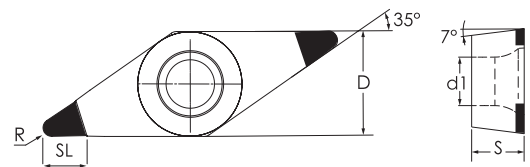
⊗ Stock Items | Itens de stock

○ Available under request | Disponível sob consulta | Disponible bajo consulta


Insert Order Code: (1) Geometry code + (2) Grade code

VC = RHOMBIC 35° POSITIVE

RÔMBICA 35° POSITIVA | RÓMBICA 35° POSITIVA



VCGW Z2

	(1) Geometry code	(2) Grade code		H		Dimensions Dimensões Dimensiones (mm)						Cutting conditions Condições de corte Condiciones de corte					
		ISO Reference	ANSI Reference	Y5	Y4	Z	D	S	R	d1	SL	ap (mm)	Min	Max	fn (mm/r)	Min	Max
				PBY603	PBY620												
	1124667	VCGW 160404-S2513 Z2	VCGW 331-S2513 Z2	⊗	⊗	2	9,53	4,76	0,4	4,4	2,8	0,15	0,08	0,45	0,08	0,05	0,2
	1124668	VCGW 160408-S2513 Z2	VCGW 332-S2513 Z2	⊗	⊗	2	9,53	4,76	0,8	4,4	2	0,2	0,08	0,5	0,1	0,08	0,3

⊗ Stock Items | Itens de stock

○ Available under request | Disponível sob consulta | Disponible bajo consulta

Insert Order Code: (1) Geometry code + (2) Grade code



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HEADQUARTERS

PALBIT, S.A.

P.O.Box 4 - Palhal

3854-908 - Branca ALB - Portugal

T (+351) 234540300 | F (+351) 234540301

palbit@palbit.pt

www.palbit.pt

Branch office:

PALBIT México

Emerson 150. Int.803-804. Colonia Chapultepec

Morales Delagación Miguel Hidalgo

C.P. 11570 México DF

T (+52) 5555 454 543 | F (+52) 5552 509 190

info@palbit.com.mx | www.palbit.com.mx

Branch office:

PALBIT Brasil

Av. João XXIII. nº20. Sl 41 - Vila Gilda

Stº André. SP. CEP 09190-500 SP Brasil

T (+55) 1125 343 648 | F (+55) 1125 343 648

palbit@palbit.com.br | www.palbit.com.br



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