

Ceramic, PcBN, and PCD Inserts

Advanced Material Inserts



Hard part turning, along with the machining of cast irons, high-temp alloys, and non-ferrous materials, can be accomplished through the use of inserts made from advanced materials. These advanced materials include ceramics, PcBN (polycrystalline cubic boron nitride), and PCD (polycrystalline diamond). WIDIA™ offers:

- Improved performance.
- Greater wear resistance.
- Longer tool life.

Ceramic Inserts

- Silicon-nitride based ceramic for cast iron machining.
- Mixed ceramic for hard machining and finishing of cast iron.
- Whisker ceramic for high-temp alloy and hard machining.

**CW2015 —
Mixed Ceramic**



**CW5025 —
Silicon-Nitride
Ceramic**

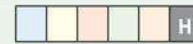


PcBN

Solid Inserts

- Inserts are made only from PcBN.
- No material joint.
- Best heat-absorption capacity.
- Can work at highest temperatures.

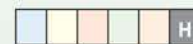
WBH25P



Tipped Inserts

- Require a carrier and a PcBN tip.
- The tips are brazed to a carrier.
- The substrate has to have a pocket that will accommodate and support the tip.

WBH25P



PCD

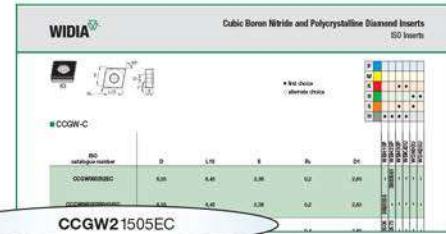
- Targeted machining of non-ferrous materials.
- Significant advantage in hardness over carbide tools.
- Increased productivity through higher speeds and longer tool life.
- Best used in processing materials that are un-machinable with conventional tooling.

WDN25U



How Do Catalogue Numbers Work?

Each character in our catalogue number signifies a specific trait of that product. Use the following key columns and corresponding images to easily identify which attributes apply.



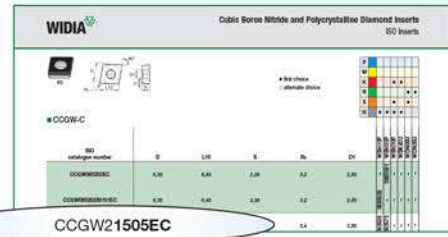
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H	Hexagon 120°	A	3°	<p>Tolerances apply prior to edge prep and coating</p> <p>D = Theoretical diameter of the insert inscribed circle S = Thickness B = See figures below</p>	<p>X V Special Design</p>	<p>Code for metric cutting edge length "L10"</p> <table border="1"> <thead> <tr> <th>"D"</th> <th>C</th> <th>D</th> <th>R</th> <th>S</th> <th>T</th> <th>V</th> <th>W</th> </tr> </thead> <tbody> <tr><td>3,97</td><td>S4</td><td>04</td><td>03</td><td>03</td><td>06</td><td>--</td><td>--</td></tr> <tr><td>4,76</td><td>04</td><td>05</td><td>04</td><td>04</td><td>08</td><td>08</td><td>S3</td></tr> <tr><td>5,56</td><td>05</td><td>06</td><td>05</td><td>05</td><td>09</td><td>09</td><td>03</td></tr> <tr><td>6,00</td><td>--</td><td>--</td><td>06</td><td>--</td><td>--</td><td>--</td><td>--</td></tr> <tr><td>6,35</td><td>06</td><td>07</td><td>06</td><td>06</td><td>11</td><td>11</td><td>04</td></tr> <tr><td>7,94</td><td>08</td><td>09</td><td>07</td><td>07</td><td>13</td><td>13</td><td>05</td></tr> <tr><td>8,00</td><td>--</td><td>--</td><td>08</td><td>--</td><td>--</td><td>--</td><td>--</td></tr> <tr><td>9,52</td><td>09</td><td>11</td><td>09</td><td>09</td><td>16</td><td>16</td><td>06</td></tr> <tr><td>10,00</td><td>--</td><td>--</td><td>10</td><td>--</td><td>--</td><td>--</td><td>--</td></tr> <tr><td>11,11</td><td>11</td><td>13</td><td>11</td><td>11</td><td>19</td><td>19</td><td>07</td></tr> <tr><td>12,00</td><td>--</td><td>--</td><td>12</td><td>--</td><td>--</td><td>--</td><td>--</td></tr> <tr><td>12,70</td><td>12</td><td>15</td><td>12</td><td>12</td><td>22</td><td>22</td><td>08</td></tr> <tr><td>14,29</td><td>14</td><td>17</td><td>14</td><td>14</td><td>24</td><td>24</td><td>09</td></tr> <tr><td>15,88</td><td>16</td><td>19</td><td>15</td><td>15</td><td>27</td><td>27</td><td>10</td></tr> <tr><td>16,00</td><td>--</td><td>--</td><td>16</td><td>--</td><td>--</td><td>--</td><td>--</td></tr> <tr><td>17,46</td><td>17</td><td>21</td><td>17</td><td>17</td><td>30</td><td>30</td><td>11</td></tr> <tr><td>19,05</td><td>19</td><td>23</td><td>19</td><td>19</td><td>33</td><td>33</td><td>13</td></tr> <tr><td>20,00</td><td>--</td><td>--</td><td>20</td><td>--</td><td>--</td><td>--</td><td>--</td></tr> <tr><td>22,22</td><td>22</td><td>27</td><td>22</td><td>22</td><td>38</td><td>38</td><td>15</td></tr> <tr><td>25,00</td><td>--</td><td>--</td><td>25</td><td>--</td><td>--</td><td>--</td><td>--</td></tr> <tr><td>25,40</td><td>25</td><td>31</td><td>25</td><td>25</td><td>44</td><td>44</td><td>17</td></tr> <tr><td>31,75</td><td>32</td><td>38</td><td>31</td><td>31</td><td>54</td><td>54</td><td>21</td></tr> <tr><td>32,00</td><td>--</td><td>--</td><td>32</td><td>--</td><td>--</td><td>--</td><td>--</td></tr> </tbody> </table>				"D"	C	D	R	S	T	V	W	3,97	S4	04	03	03	06	--	--	4,76	04	05	04	04	08	08	S3	5,56	05	06	05	05	09	09	03	6,00	--	--	06	--	--	--	--	6,35	06	07	06	06	11	11	04	7,94	08	09	07	07	13	13	05	8,00	--	--	08	--	--	--	--	9,52	09	11	09	09	16	16	06	10,00	--	--	10	--	--	--	--	11,11	11	13	11	11	19	19	07	12,00	--	--	12	--	--	--	--	12,70	12	15	12	12	22	22	08	14,29	14	17	14	14	24	24	09	15,88	16	19	15	15	27	27	10	16,00	--	--	16	--	--	--	--	17,46	17	21	17	17	30	30	11	19,05	19	23	19	19	33	33	13	20,00	--	--	20	--	--	--	--	22,22	22	27	22	22	38	38	15	25,00	--	--	25	--	--	--	--	25,40	25	31	25	25	44	44	17	31,75	32	38	31	31	54	54	21	32,00	--	--	32	--	--	--	--
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C	±0,025	±0,013	±0,025
H	±0,013	±0,013	±0,025
E	±0,025	±0,025	±0,025
G	±0,025	±0,025	±0,013
M	See tables on next page		±0,013
U	See tables on next page		±0,013

*Tolerances apply prior to edge prep and coating.

By referencing this easy-to-use guide, you can identify the correct product to meet your needs.



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Thickness "S"	Corner Radius "Re"	Hand of Insert (optional)	Cutting Edge (optional)	T-Land Width (optional)	T-Land Angle (optional)	Tip Style (optional)	Chipbreaker (optional)																																																																																											
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**Also available in wiper style.*

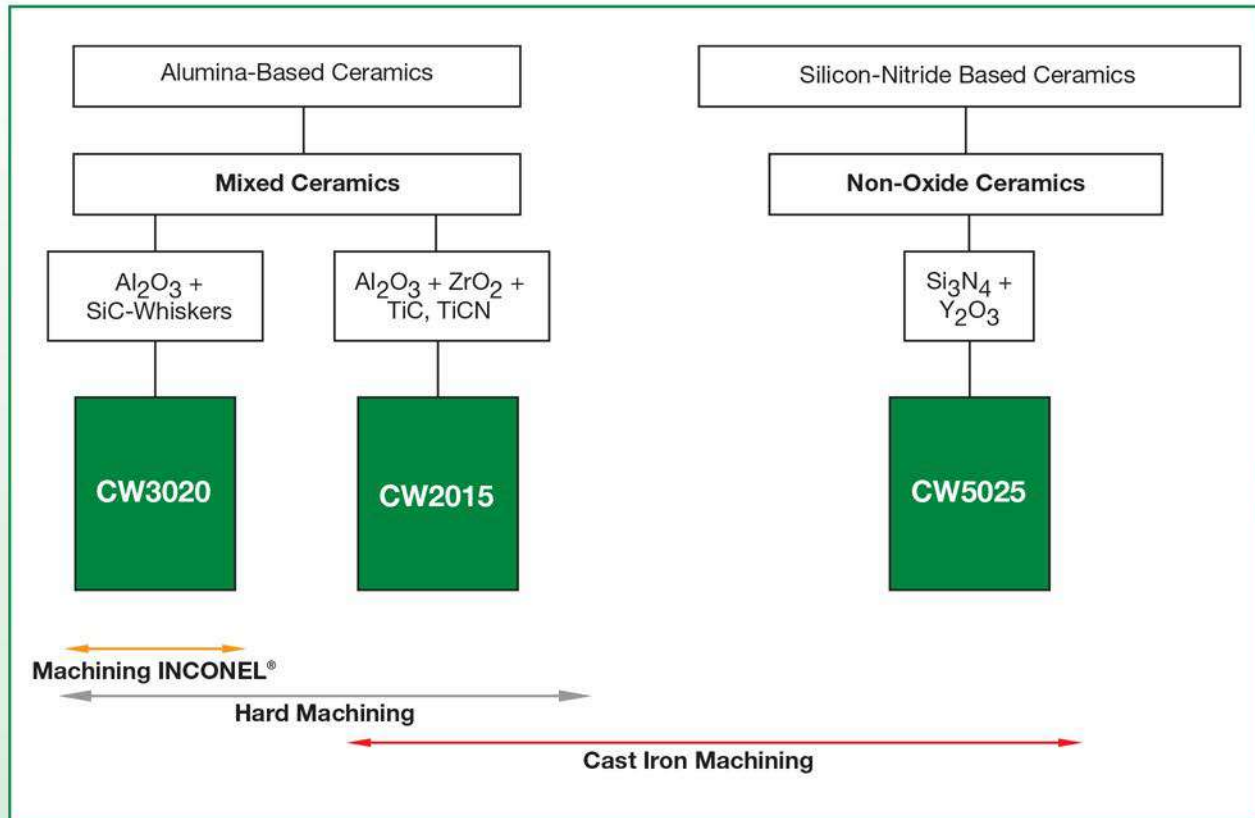
"D"	± Tolerance on "D"				"D"	± Tolerance on "B"			
	Class M Tolerance			Class U Tolerance		Class M Tolerance			Class U Tolerance
	Shapes S, T, C, R, & W	Shape D	Shape V	Shapes S, T, & C		Shapes S, T, C, R, & W	Shape D	Shape V	Shapes S, T, & C
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4,76	0,05	—	—	0,08	4,76	0,08	—	—	0,13
5,56	0,05	0,05	0,05	0,08	5,56	0,08	0,11	—	0,13
6,35	0,05	0,05	0,05	0,08	6,35	0,08	0,11	—	0,13
7,94	0,05	0,05	0,05	0,08	7,94	0,08	0,11	—	0,13
9,52	0,05	0,05	0,05	0,08	9,52	0,08	0,11	0,18	0,13
11,11	0,08	0,08	0,08	0,13	11,11	0,13	0,15	—	—
12,70	0,08	0,08	0,08	0,13	12,70	0,13	0,15	0,25	0,20
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15,88	0,10	0,10	0,10	0,18	15,88	0,15	0,18	—	0,27
17,46	0,10	0,10	0,10	0,18	17,46	0,15	0,18	—	0,27
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22,22	0,13	—	—	0,25	22,22	0,15	—	—	0,38
25,40	0,13	—	—	0,25	25,40	0,18	—	—	0,38
31,75	0,15	—	—	0,25	31,75	0,20	—	—	0,38

Ceramic Inserts for Hard Turning, Turning in Cast Iron Materials, and Turning in High-Temp Alloys



- Ceramics offer greater wear resistance and toughness.
- Ceramics can be used in high-speed, continuous, and lightly interrupted turning applications in cast iron materials.
- Ceramics can be used for high-speed applications in high-temp alloys.

Ceramic Turning Grades



CW2015™

- Alumina and titanium carbo-nitride.
- High hardness and wear resistance.
- TiCN increases strength and hardness.
- Black in colour.

CW3020™

- Alumina + SiC whisker.
- High hardness and wear resistance.
- Whisker ceramic with elongated crystals and very high strength.
- Grey-green colour.

CW5025™

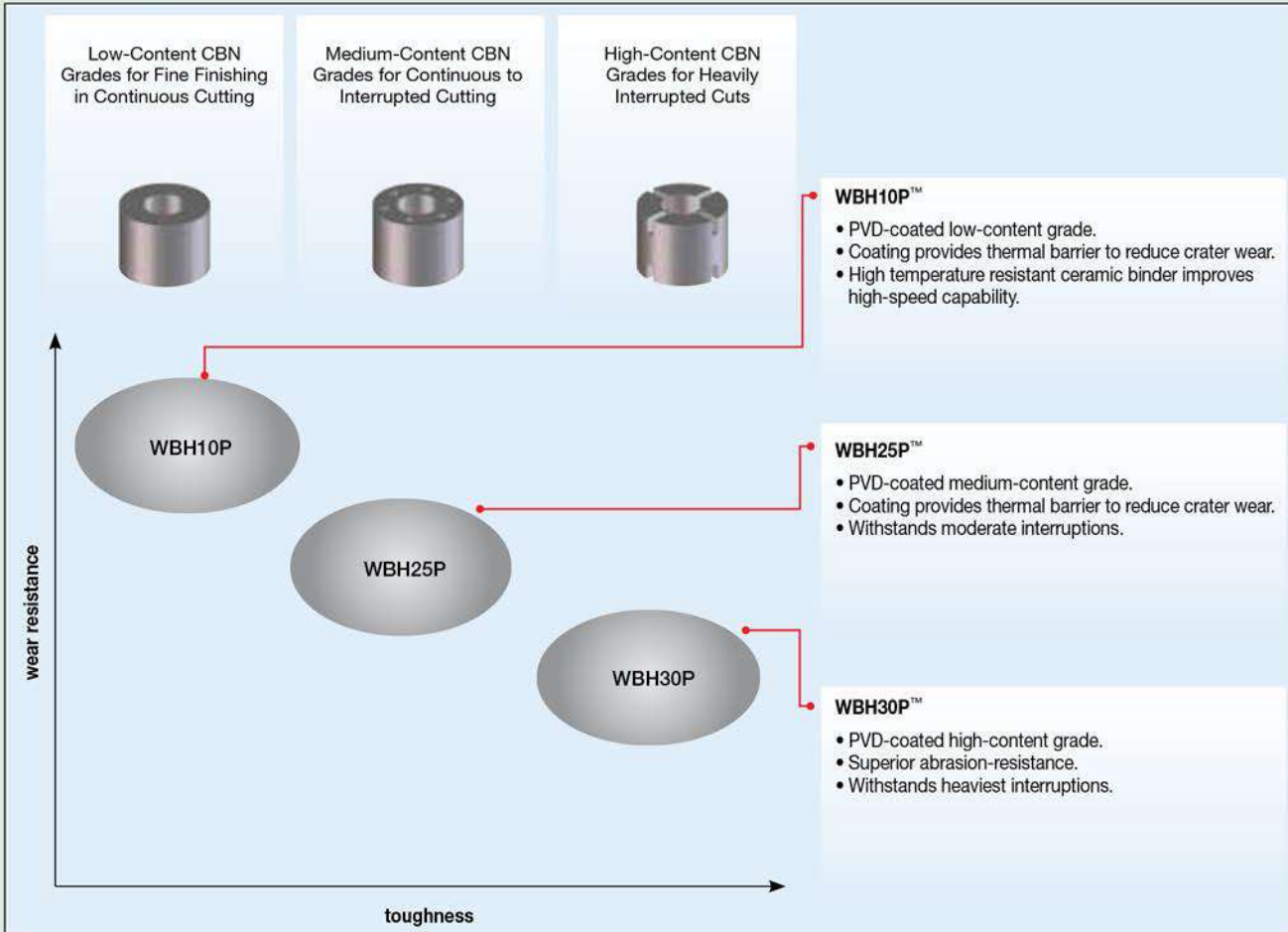
- Pure silicon-nitride composition.
- Used in high-speed turning applications.
- Designed for use in grey cast iron and lower tensile ductile irons.

PcBN Grades for Hard Turning, Powder Metal, and Grey Cast Iron Machining

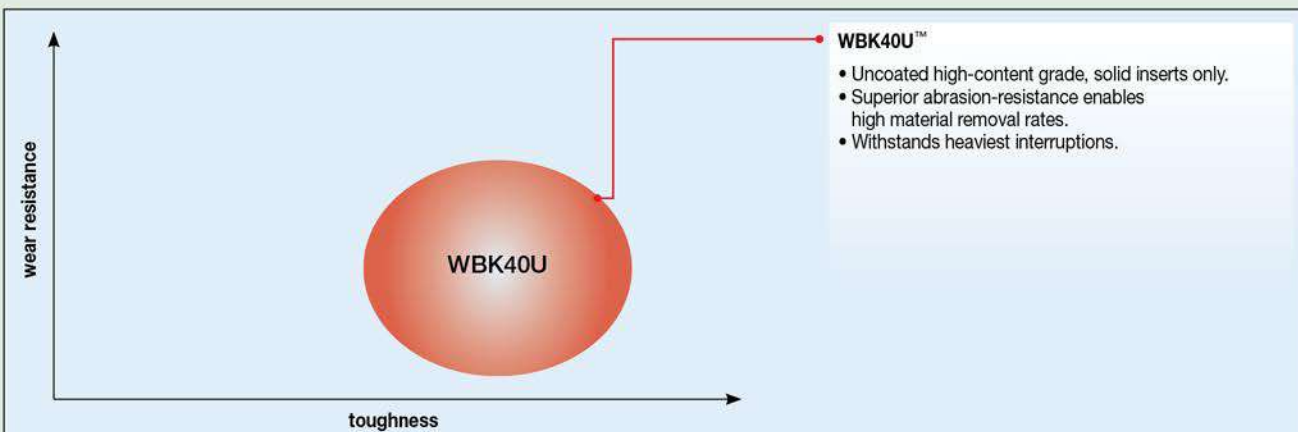


- PVD-coated grades available.
- Complete range of CBN grades for continuous to heavily interrupted turning.
- Industry-leading grades for grey cast iron machining.
- Full line of grades for hard turning.
- For best performance: solid, full-top, and tipped inserts are available.

Hard Turning Grades



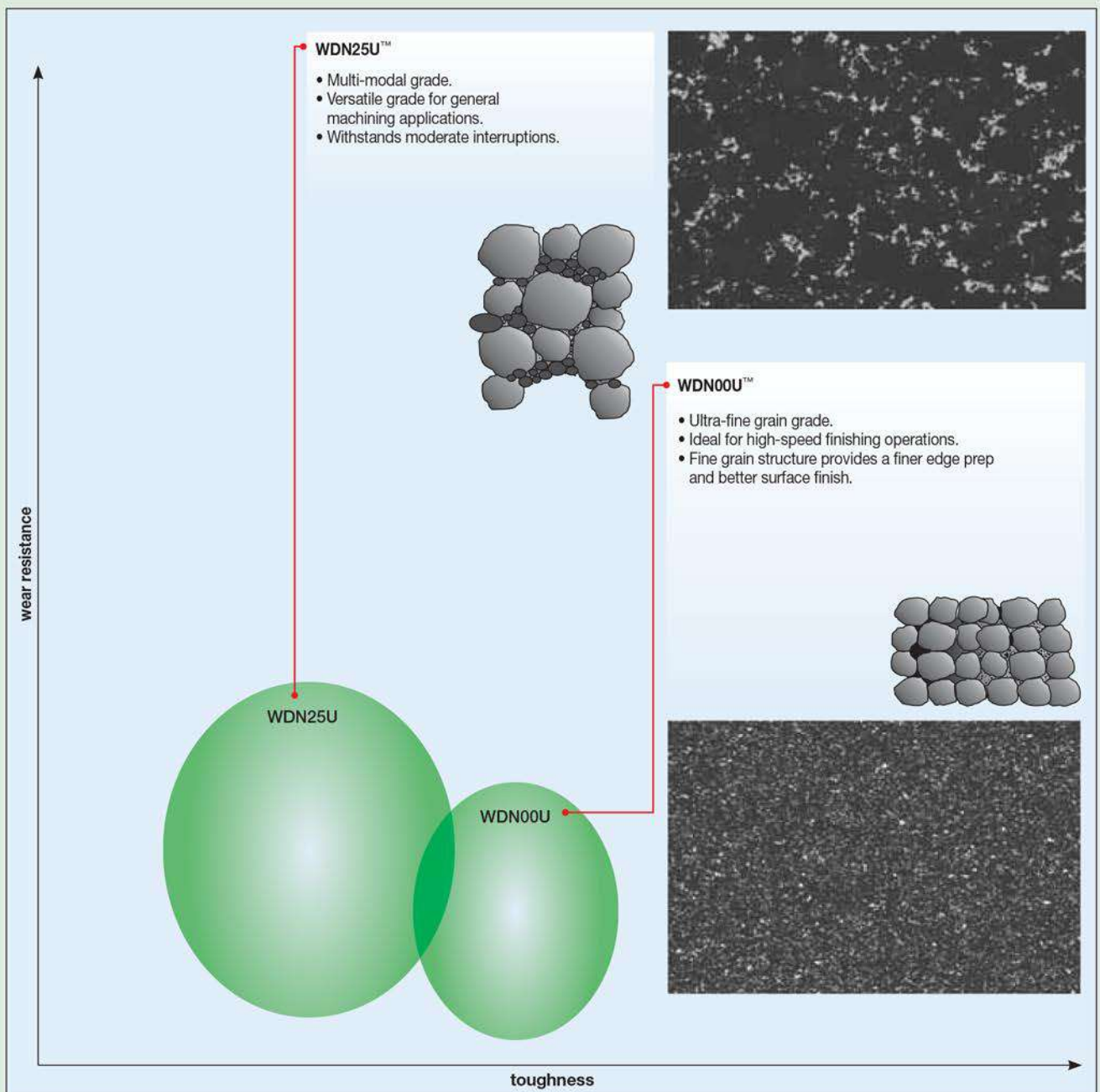
Grey Cast Iron Grades



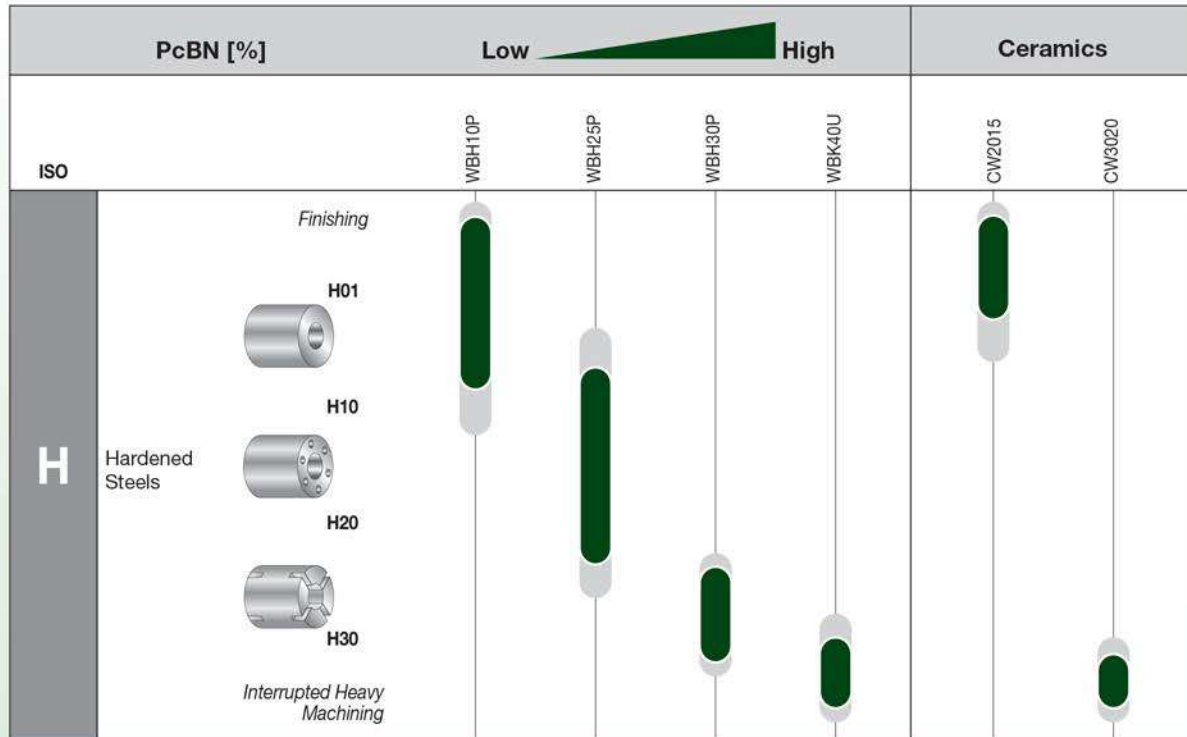
PCD Grades for Turning Non-Ferrous Materials



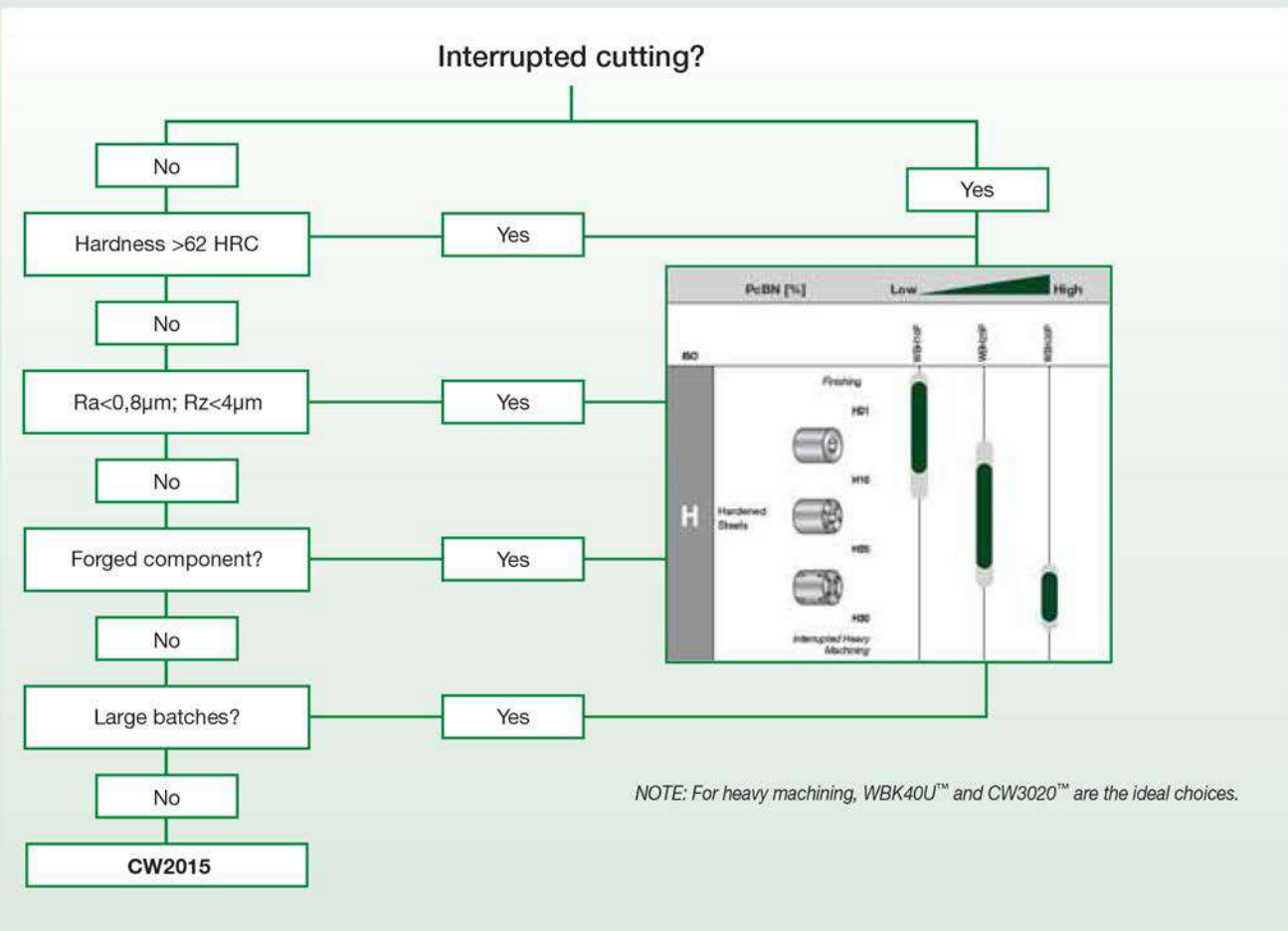
- Two PCD grades — WDN25U and WDN00U — cover a wide range of applications.
- New grades provide outstanding performance to increase productivity and cut manufacturing costs.
- High abrasion and chipping resistance.
- Used in machining aluminium alloys with low- and high-silicon content, copper alloys, ceramics, and plastics.
- Suitable for machining highly abrasive materials such as titanium and Metal Matrix Composites (MMC).



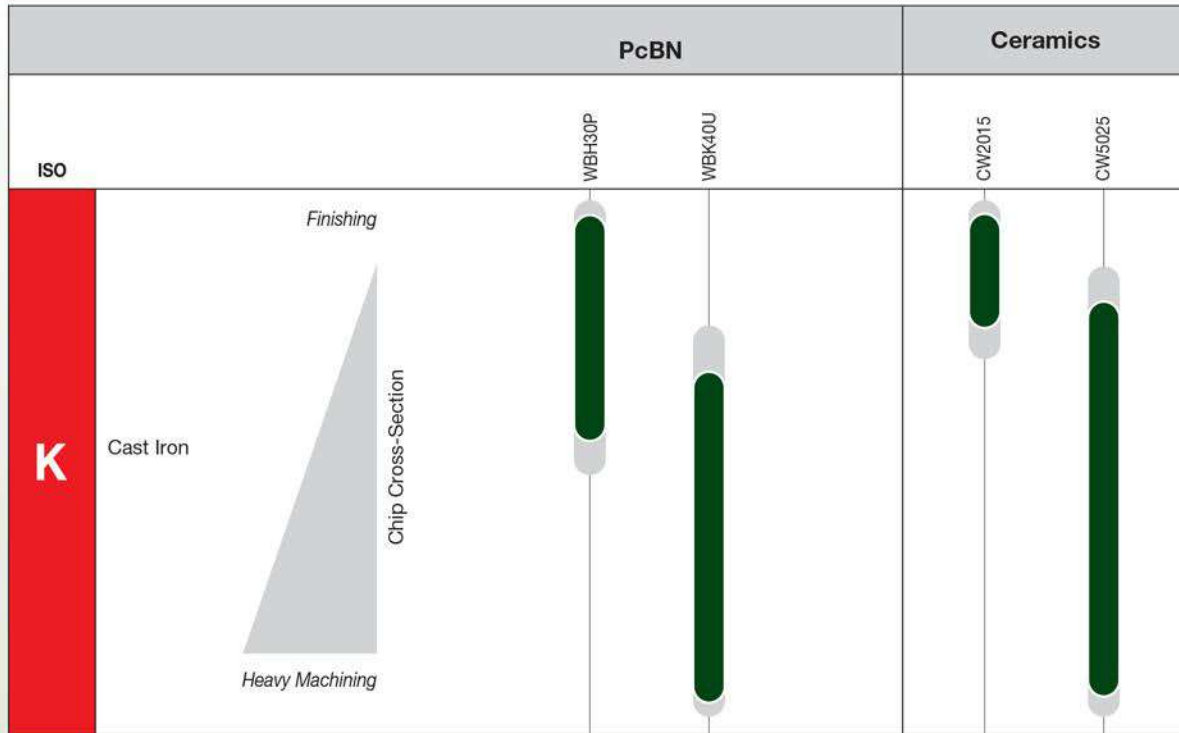
Advanced Materials for Hard Turning



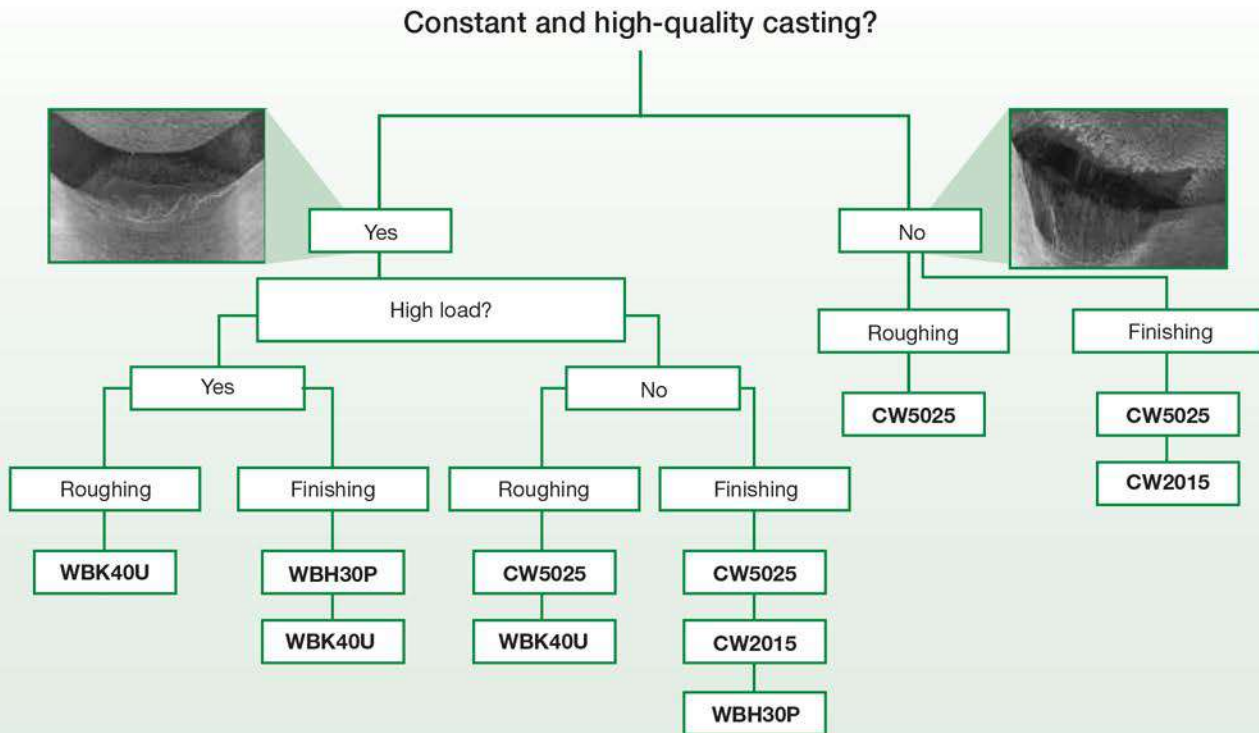
Hard Turning Grade Selection



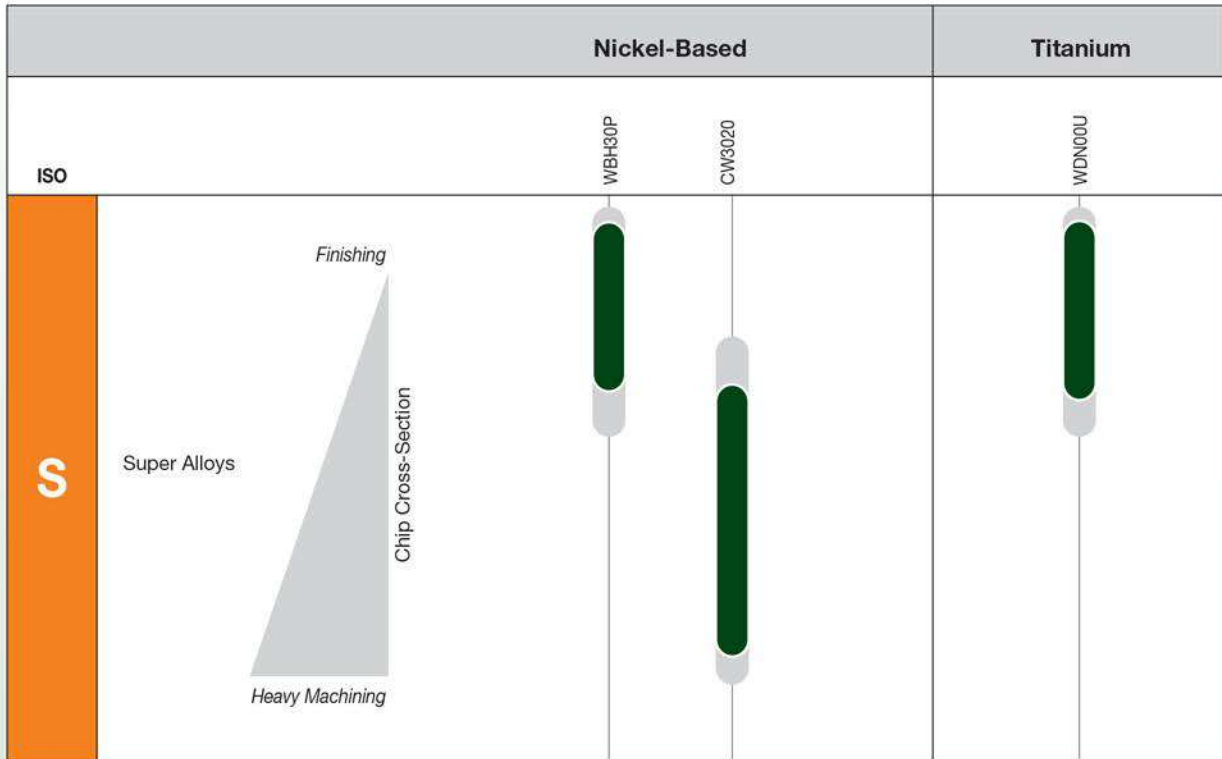
Advanced Materials for Cast Iron Machining



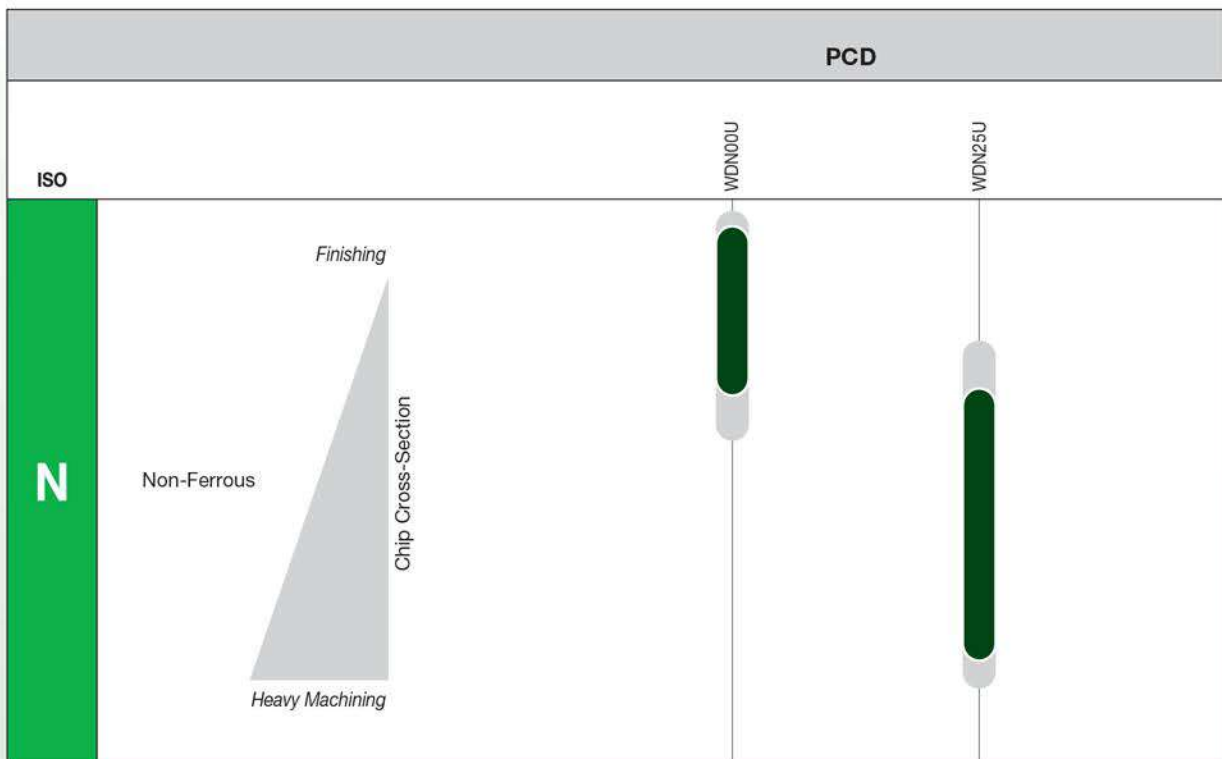
Cast Iron Machining Grade Selection

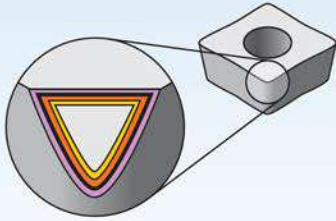


Advanced Materials for High-Temperature Machining



Advanced Materials for Non-Ferrous Machining





Reduce cycle times. High speed and feed capability. Long tool life. New multi-layer coating provides better wear resistance.

P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High-Temp Alloys
H	Hardened Materials

wear resistance ← → toughness

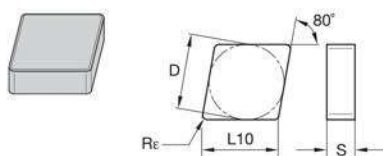
Grade	Coating	Grade Description	Material Type																			
			05	10	15	20	25	30	35	40	45											
CW2015		Mixed (black) ceramic. Matrix Al ₂ O ₃ and TiCN. Good toughness properties combined with good wear resistance. Semi-finishing and finishing. For hardened iron base materials and grey cast iron (finishing).																				
	CM-H10																					
CW5025		Silicon-nitride ceramic. Extraordinary toughness properties. Roughing, also in heavily interrupted cuts. Capable of high-performance turning. To be used with or without coolant. For grey cast iron.																				
	CN-K15																					
CW3020		Whisker ceramic with a matrix of Al ₂ O ₃ + SiCw. The SiC whiskers embedded in the micro-structure give this ceramic excellent toughness for cutting high-temp alloys and cast materials with high Brinell hardness.																				
	C4																					
WBK40U		A high CBN content, solid CBN insert with multiple cutting edges. Applied in roughing to finishing of fully pearlitic grey cast iron, chilled irons, high-chrome alloyed steels, sintered powdered metals, and heavy cuts in hardened steels (>45 HRC). Use for finishing chilled and fully pearlitic cast iron. Solid inserts offer better security and shock-resistance than tipped inserts, while also enabling deeper depth-of-cut capability.																				
	BN-K40																					
WBH10P		A low content CBN grade with a PVD-TiAlN coating for added wear resistance. Designed for precision machining of hardened steels (>45 HRC); the harder the steel the better. PVD coating offers improved wear resistance and excellent surface finish capability. Effectively applied on bearing steels, hot and cold work tool steels, high-speed steels, die steels, case-hardened steels, carburised and nitrided irons, and some hard coatings.																				
	BN-H10																					

Material Group		Cutting Speed – vc m/min								
		CW2015			CW3020			CW5025		
		min	Start	max	min	Start	max	min	Start	max
ap [mm]		0,5		4,0	0,5		4,0	1,0		8,0
f [mm/rev]		0,2		0,4	0,1		5,0	0,2		0,6
P	0	-	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-
M	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
K	1	250	475	725	-	-	-	250	760	1000
	2	300	550	800	-	-	-	275	365	490
	3	250	400	600	-	-	-	275	335	440
N	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-
	6	-	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-	-	-	-
	8	-	-	-	-	-	-	-	-	-
S	1	-	-	-	170	200	375	-	-	-
	2	-	-	-	170	200	375	-	-	-
	3	-	-	-	190	250	375	-	-	-
	4	-	-	-	-	-	-	-	-	-
H	1	60	100	140	45	85	125	-	-	-
	2	60	100	140	45	85	125	-	-	-
	3	60	100	140	45	85	125	-	-	-
	4	60	100	140	45	85	125	-	-	-

Inserts

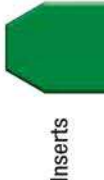
Inserts

Material Group		Cutting Speed – vc m/min																	
		WBH10P			WBH25P			WBH30P			WBK40U			WDN00U			WDN25U		
		min	Start	max	min	Start	max	min	Start	max	min	Start	max	min	Start	max	min	Start	max
ap [mm]		0,10	0,50		0,10	0,50		0,08	0,40		0,10	1,50		0,20	2,00		0,20	2,00	
f [mm/rev]		0,06	0,25		0,05	0,20		0,05	0,20		0,08	0,20		0,10	0,30		0,10	0,25	
P	0/1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K	1	-	-	-	-	-	-	400	600	800	650	800	1200	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N	1	-	-	-	-	-	-	-	-	-	-	-	-	500	765	2500	500	765	2500
	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	350	580	1000
	3	-	-	-	-	-	-	-	-	-	-	-	-	250	520	1000	250	520	1000
	4	-	-	-	-	-	-	-	-	-	-	-	-	250	400	750	250	400	750
	5	-	-	-	-	-	-	-	-	-	-	-	-	550	760	1000	550	760	1000
	6	-	-	-	-	-	-	-	-	-	-	-	-	400	460	850	400	365	750
	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S	1	-	-	-	-	-	-	120	160	200	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	120	160	200	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	120	160	200	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-	-	-	100	180	320	-	-	-
H	1	80	170	260	80	160	230	60	120	220	60	120	220	-	-	-	-	-	-
	2	80	170	260	80	160	230	60	120	220	60	120	220	-	-	-	-	-	-
	3	80	170	260	80	160	230	60	120	220	60	120	220	-	-	-	-	-	-
	4	80	170	260	80	160	230	60	120	220	60	120	220	-	-	-	-	-	-



● first choice
○ alternate choice

P			
M			
K	●		●
N			
S		●	
H	●		

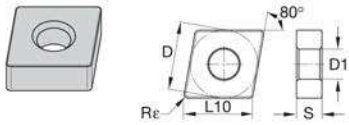


■ CNGN/CNG

ISO catalogue number	D	L10	S	Re	D1	CW2015	CW3020	CW5025
CNGN120404T02020	12,70	12,90	4,76	0,4	—	2952551	—	—
CNGN120408T01020	12,70	12,90	4,76	0,8	—	—	3869578	—
CNGN120408T02020	12,70	12,90	4,76	0,8	—	2952552	—	2952082
CNGN120412T01020	12,70	12,90	4,76	1,2	—	—	3869579	—
CNGN120412T02020	12,70	12,90	4,76	1,2	—	2952603	—	2952113
CNGN120416T01020	12,70	12,90	4,76	1,6	—	—	3869580	—
CNGN120416T02020	12,70	12,90	4,76	1,6	—	2952604	—	2952114
CNGN120712T01020	12,70	12,90	7,94	1,2	—	—	3869581	—
CNGN120712T02020	12,70	12,90	7,94	1,2	—	2952605	—	2952115
CNGN120716T01020	12,70	12,90	7,94	1,6	—	—	3869582	—



Inserts

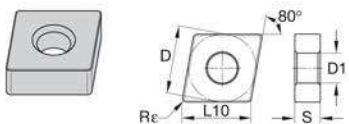


● first choice
○ alternate choice

P				
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K	●			●
N				
S			●	
H	●			

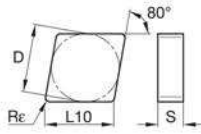
■ CNGA

ISO catalogue number	D	L10	S	Rε	D1	CW2015	CW3020	CW5025
CNGA120404T02020	12,70	12,90	4,76	0,4	5,16	2952526	●	●
CNGA120408T02020	12,70	12,90	4,76	0,8	5,16	2952527	●	2952159
CNGA120412T02020	12,70	12,90	4,76	1,2	5,16	2952528	●	2952161
CNGA120416T02020	12,70	12,90	4,76	1,6	5,16	●	●	2952173
CNGA160612T02020	15,88	16,12	6,35	1,2	6,35	2952529	●	2952174
CNGA160616T02020	15,88	16,12	6,35	1,6	6,35	●	●	2952175
CNGA190612T02020	19,05	19,34	6,35	1,2	7,93	2952530	●	2952176
CNGA190616T02020	19,05	19,34	6,35	1,6	7,93	2952531	●	●



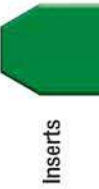
■ CNGA-FW

ISO catalogue number	D	L10	S	Rε	D1	CW2015	CW3020	CW5025
CNGA120408T01020FW	12,70	12,90	4,76	0,8	5,16	●	●	2952158
CNGA120412T01020FW	12,70	12,90	4,76	1,2	5,16	●	●	2952160
CNGA120416T01020FW	12,70	12,90	4,76	1,6	5,16	●	●	2952162



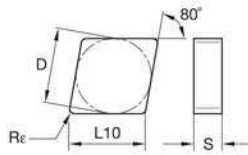
● first choice
○ alternate choice

P	■		
M	■		
K	●	●	●
N	■		
S	■	●	
H	●		



■ **CNGX**

ISO catalogue number	D	L10	S	Rε	D1	CW2015	CW3020	CW5025
CNGX120708T02020	12,70	12,90	7,94	0,8	—			2952117
CNGX120712T02020	12,70	12,90	7,94	1,2	—			2952119
CNGX160716T02020	15,88	16,12	7,94	1,6	—			2952121

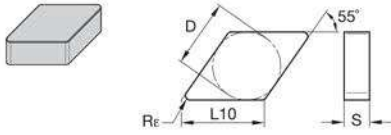


■ **CNGX-FW**

ISO catalogue number	D	L10	S	Rε	D1	CW2015	CW3020	CW5025
CNGX120712T01020FW	12,70	12,90	7,94	1,2	—			2952118



Inserts

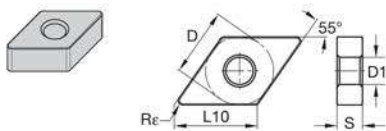


● first choice
○ alternate choice

P			
M			
K	●		●
N			
S		●	
H	●		

■ DNGN/DNG

ISO catalogue number	D	L10	S	Re	D1	CW2015	CW3020	CW5025
DNGN150704T02020	12,70	15,50	7,94	0,4	—	2952607	—	—
DNGN150708T01020	12,70	15,50	7,94	0,8	—	—	3869743	—
DNGN150708T02020	12,70	15,50	7,94	0,8	—	2952608	—	—
DNGN150712T02020	12,70	15,50	7,94	1,2	—	2952609	—	—
DNGN150716T01020	12,70	15,50	7,94	1,6	—	—	3869745	—



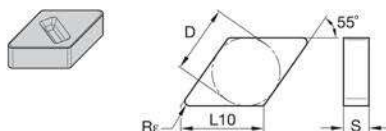
● first choice
○ alternate choice

P			
M			
K	●		●
N			
S		●	
H	●		

Inserts

■ DNGA

ISO catalogue number	D	L10	S	Re	D1	CW2015	CW3020	CW5025
DNGA150404T02020	12,70	15,50	4,76	0,4	5,16	2952532		
DNGA150408T02020	12,70	15,50	4,76	0,8	5,16	2952533		
DNGA150412T02020	12,70	15,50	4,76	1,2	5,16	2952534		2952184
DNGA150604T02020	12,70	15,50	6,35	0,4	5,16	2952535		
DNGA150608T02020	12,70	15,50	6,35	0,8	5,16	2952536		
DNGA150612T02020	12,70	15,50	6,35	1,2	5,16	2952537		2952185

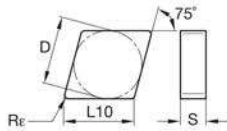


■ DNGX

ISO catalogue number	D	L10	S	Re	D1	CW2015	CW3020	CW5025
DNGX120712T02020	10,00	12,21	7,94	1,2	—			2952124
DNGX120716T02020	10,00	12,21	7,94	1,6	—			2952125
DNGX150708T02020	12,70	15,50	7,94	0,8	—			2952126
DNGX150712T02020	12,70	15,50	7,94	1,2	—			2952127
DNGX150716T02020	12,70	15,50	7,94	1,6	—			2952128



Inserts

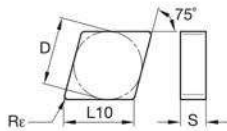


● first choice
○ alternate choice

P			
M			
K	●		●
N			
S		●	
H	●		

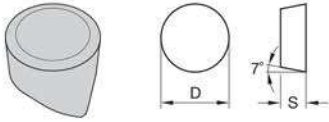
■ ENGN/ENG

ISO catalogue number	D	L10	S	Rε	D1	CW2015	CW3020	CW5025
ENGN130704T02020	12,70	13,15	7,94	0,4	—	2952611	●	●
ENGN130708T02020	12,70	13,15	7,94	0,8	—	2952612	●	●
ENGN130712T02020	12,70	13,15	7,94	1,2	—	2952613	●	●
ENGN130716T02020	12,70	13,15	7,94	1,6	—	2952614	●	●



■ ENGX

ISO catalogue number	D	L10	S	Rε	D1	CW2015	CW3020	CW5025
ENGX130716T02020	12,70	13,15	7,94	1,6	—	●	●	2952130



● first choice
○ alternate choice

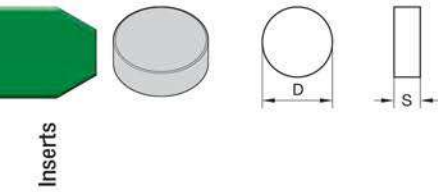
P	■		
M	■		
K	●	●	●
N	■		
S	■	●	
H	●		



■ RCGX/RCGV

ISO catalogue number	D	S	CW2015	CW3020	CW5025
RCGX060400T01020	6,35	4,76	■	3869746	■
RCGX090700T02020	9,53	7,92	2952694	■	■
RCGX090700T07015	9,53	7,92	2952695	■	■
RCGX090700T01020	9,53	7,94	2952693	3869747	■
RCGX120700T01020	12,70	7,92	■	3869748	■
RCGX120700T02020	12,70	7,92	2952697	■	■
RCGX120700T20015	12,70	7,92	2952698	■	■



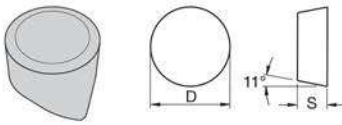


● first choice
○ alternate choice

P			
M			
K	●		●
N			
S		●	
H	●		

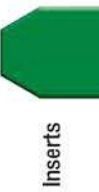
■ RNGN/RNG

ISO catalogue number	D	S	CW2015	CW3020	CW5025
RNGN090300T01020	9,53	3,18	-	3869749	-
RNGN090400T02020	9,53	4,76	2952615	-	-
RNGN120400T01020	12,70	4,76	-	3869750	-
RNGN120400T02020	12,70	4,76	2952616	-	2952131
RNGN120700T01020	12,70	7,94	-	3869751	-
RNGN120700T02020	12,70	7,94	2952617	-	-
RNGN120700T10015	12,70	7,94	2952618	-	-
RNGN120700T20015	12,70	7,94	2952619	-	-
RNGN150700T02020	15,88	7,94	2952620	-	2952133



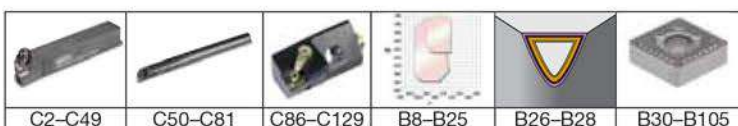
● first choice
○ alternate choice

P	■		
M	■		
K	●	●	●
N	■		
S	■	●	
H	●		

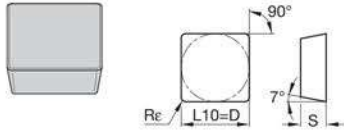


■ **RPGV**

ISO catalogue number	D	S	CW2015	CW3020	CW5025
RPGX060400T01020	6,35	4,78		3869753	
RPGX090700T01020	9,53	7,92		3869754	
RPGX120700T01020	12,70	7,94		3869755	



Inserts

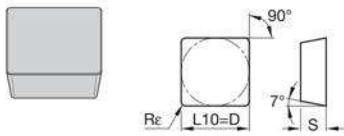


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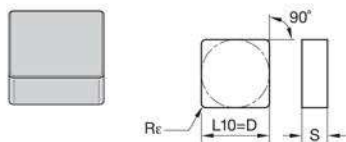
■ SCGN/SCG

ISO catalogue number	D	L10	S	Rε	D1	CW2015	CW3020	CW5025
SCGN090412T00520	9,53	9,53	4,76	1,2	—	I	I	2952147



■ SCUN/SCU

ISO catalogue number	D	L10	S	Rε	D1	CW2015	CW3020	CW5025
SCUN120412T00520	12,70	12,70	4,76	1,2	—	2952699	I	I



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■ SNGN/SNG

ISO catalogue number	D	L10	S	Rr	D1	CW2015	CW3020	CW5025
SNGN090308T02020	9,53	9,53	3,18	0,8	—	2952748	2952748	2952748
SNGN090412T00515	9,53	9,53	4,76	1,2	—	2952749	2952749	2952749
SNGN120408T00520	12,70	12,70	4,76	0,8	—	2952750	2952750	2952750
SNGN120408T02020	12,70	12,70	4,76	0,8	—	2952751	2952751	2952135
SNGN120412T01020	12,70	12,70	4,76	1,2	—	2952752	3869756	2952136
SNGN120412T02020	12,70	12,70	4,76	1,2	—	2952752	2952136	2952136
SNGN120416T01020	12,70	12,70	4,76	1,6	—	3869757	3869757	2952137
SNGN120416T02020	12,70	12,70	4,76	1,6	—	2952137	2952137	2952137
SNGN120704T02020	12,70	12,70	7,94	0,4	—	2952824	2952824	2952824
SNGN120708T02020	12,70	12,70	7,94	0,8	—	2952825	2952825	2952825
SNGN120712T00520	12,70	12,70	7,94	1,2	—	2953339	2953339	2953339
SNGN120712T01020	12,70	12,70	7,94	1,2	—	3869758	3869758	3869758

(continued)



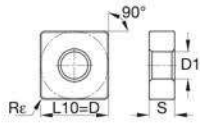
(SNGN/SNG – continued)

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ISO catalogue number	D	L10	S	Re	D1	CW2015	CW3020	CW5025
SNGN120712T02020	12,70	12,70	7,94	1,2	—	2952826	—	2952138
SNGN120716T00520	12,70	12,70	7,94	1,6	—	2953340	—	—
SNGN120716T01020	12,70	12,70	7,94	1,6	—	—	3869759	—
SNGN120716T02020	12,70	12,70	7,94	1,6	—	—	—	2952139
SNGN120720T02020	12,70	12,70	7,94	2,0	—	2952828	—	—
SNGN120720T10015	12,70	12,70	7,94	2,0	—	2952829	—	—
SNGN150712T02020	15,88	15,88	7,94	1,2	—	2952830	—	—
SNGN150716T02020	15,88	15,88	7,94	1,6	—	2952831	—	—
SNGN190720K20015	19,05	19,05	7,94	2,0	—	2952832	—	—
SNGN190720T20015	19,05	19,05	7,94	2,0	—	2952833	—	—



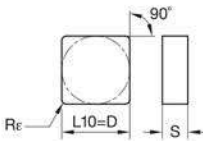
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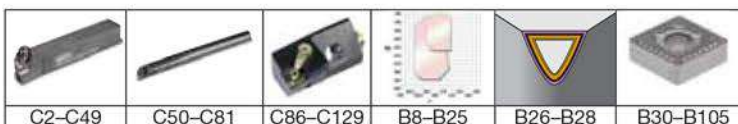
■ SNGA

ISO catalogue number	D	L10	S	R _ε	D1	CW2015	CW3020	CW5025
SNGA120408T02020	12,70	12,70	4,76	0,8	5,16	2952538	2952538	2952187
SNGA120412T02020	12,70	12,70	4,76	1,2	5,16	2952539	2952539	2952188
SNGA120416T02020	12,70	12,70	4,76	1,6	5,16	2952540	2952540	2952189
SNGA150612T02020	15,88	15,88	6,35	1,2	6,35	2952190	2952190	2952191
SNGA150616T02020	15,88	15,88	6,35	1,6	6,35	2952191	2952191	2952191

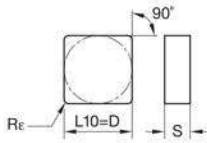


■ SNGX

ISO catalogue number	D	L10	S	R _ε	D1	CW2015	CW3020	CW5025
SNGX120708T02020	12,70	12,70	7,94	0,8	—	2952140	2952140	2952144
SNGX150716T02020	15,88	15,88	7,94	1,6	—	2952144	2952144	2952144



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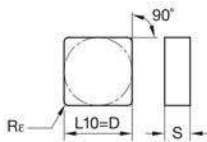


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■ SNGX-FW

ISO catalogue number	D	L10	S	Rε	D1	CW2015	CW3020	CW5025
SNGX120712T01020FW	12,70	12,70	7,94	1,2	—	●	●	○



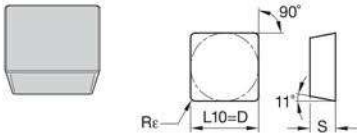
■ SNMX

ISO catalogue number	D	L10	S	Rε	D1	CW2015	CW3020	CW5025
SNMX120712T02020	12,70	12,70	7,94	1,2	—	●	●	○
SNMX120716T02020	12,70	12,70	7,94	1,6	—	●	●	○
SNMX150716T02020	15,88	15,88	7,94	1,6	—	●	●	○



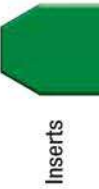
■ SPGN-T/SPG-T

ISO catalogue number	D	L10	S	Rε	D1	CW2015	CW3020	CW5025
SPGN090308T01020	9,53	9,53	3,18	0,8	—	●	●	○
SPGN120304T01020	12,70	12,70	3,18	0,4	—	●	●	○
SPGN120308T01020	12,70	12,70	3,18	0,8	—	●	●	○



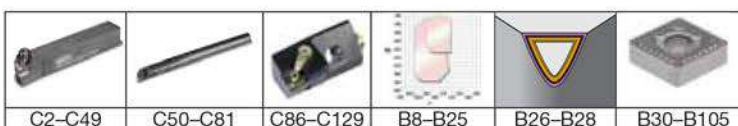
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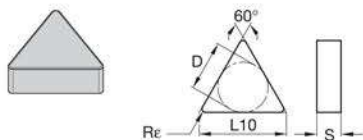


■ SPUN-T

ISO catalogue number	D	L10	S	Rε	D1	CW2015	CW3020	CW5025
SPUN120304T00520	12,70	12,70	3,18	0,4	—	2952703		
SPUN120308T00520	12,70	12,70	3,18	0,8	—	2952704		
SPUN120312T00520	12,70	12,70	3,18	1,2	—	2952705		



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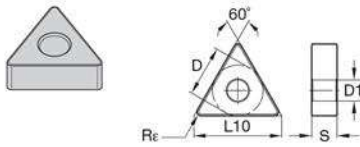


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■ TNGN/TNG

ISO catalogue number	D	L10	S	Re	D1	CW2015	CW3020	CW5025
TNGN160404T02020	9,53	16,50	4,76	0,4	—	2952835		
TNGN160408T01020	9,53	16,50	4,76	0,8	—		3869761	
TNGN160408T02020	9,53	16,50	4,76	0,8	—	2952836		2952072
TNGN160412T02020	9,53	16,50	4,76	1,2	—	2952837		2952153
TNGN160416T02020	9,53	16,50	4,76	1,6	—	2952838		
TNGN160708T02020	9,53	16,50	7,94	0,8	—	2952839		
TNGN160712T02020	9,53	16,50	7,94	1,2	—	2952840		
TNGN220408T02020	12,70	22,00	4,76	0,8	—	2952841		
TNGN220416T02020	12,70	22,00	4,76	1,6	—			2952154



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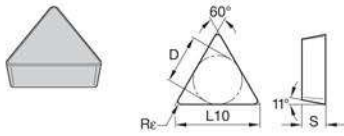


■ TNGA

ISO catalogue number	D	L10	S	Rε	D1	CW2015	CW3020	CW5025
TNGA160408T02020	9,53	16,50	4,76	0,8	3,81	2952541		2952195
TNGA160412T02020	9,53	16,50	4,76	1,2	3,81	2952542		2952196
TNGA160416T02020	9,53	16,50	4,76	1,6	3,81	2952543		2952197
TNGA220408T02020	12,70	22,00	4,76	0,8	5,16	2952544		



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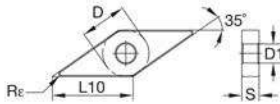


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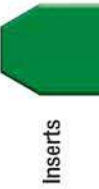
■ TPG

ISO catalogue number	D	L10	S	Rε	D1	CW2015	CW3020	CW5025
TPGN110304T01020	6,35	11,00	3,18	0,4	—	2952706	—	—
TPGN110308T01020	6,35	11,00	3,18	0,8	—	2952707	—	—
TPGN110312T01020	6,35	11,00	3,18	1,2	—	2952708	—	—
TPGN160304T00520	9,53	16,50	3,18	0,4	—	2952709	—	—
TPGN160304T01020	9,53	16,50	3,18	0,4	—	2952710	—	—
TPGN160308T00520	9,53	16,50	3,18	0,8	—	2952711	—	—
TPGN160308T01020	9,53	16,50	3,18	0,8	—	2952712	—	—
TPGN160308T02020	9,53	16,50	3,18	0,8	—	—	—	2952155
TPGN160312T01020	9,53	16,50	3,18	1,2	—	2952713	—	—
TPGN160312T02020	9,53	16,50	3,18	1,2	—	—	—	2952156



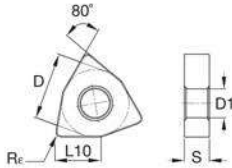
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VNGA

ISO catalogue number	D	L10	S	Rε	D1	CW2015	CW3020	CW5025
VNGA160404T02020	9,53	16,61	4,76	0,4	3,81	2952545	■	■
VNGA160408T02020	9,53	16,61	4,76	0,8	3,81	2952546	■	2952198
VNGA160412T02020	9,53	16,61	4,76	1,2	3,81	2952547	■	■
VNGA220408T02020	12,70	22,14	4,76	0,8	5,16	2952548	■	■

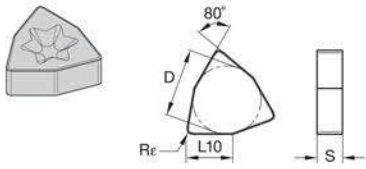


WNGA

ISO catalogue number	D	L10	S	Rε	D1	CW2015	CW3020	CW5025
WNGA080408T02020	12,70	8,69	4,76	0,8	5,16	■	■	2952199
WNGA080412T02020	12,70	8,69	4,76	1,2	5,16	■	■	2952200
WNGA080416T02020	12,70	8,69	4,76	1,6	5,16	■	■	2952201



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■ WNGX

ISO catalogue number	D	L10	S	Re	D1	CW2015	CW3020	CW5025
WNGX080712T02020	12,70	8,69	7,94	1,2	—			2952157