

# MASTER CATALOG 2018

VOLUME ONE | **TURNING TOOLS**



ISO/ANSI TURNING | GROOVING & CUT-OFF | THREADING | APPLICATION SPECIFIC

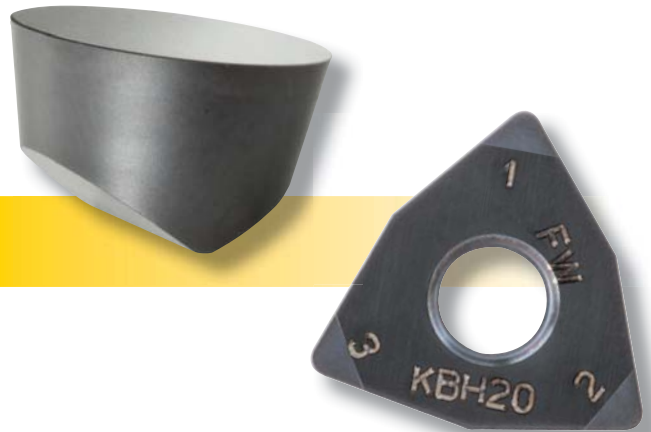
# ➤ Turning with Advanced Material Inserts

## Ceramic, PcBN, and PCD Inserts

Turning inserts made from advanced materials, such as ceramics, PcBN (polycrystalline cubic boron nitride), and PCD (polycrystalline diamond), can be applied in hard-part turning and machining of cast irons, hardened materials, high-temp alloys, and non-ferrous materials.

Ceramic, PcBN, and PCD inserts offer:

- Improved performance.
- Greater wear resistance.



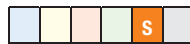
### Ceramic Inserts

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

KYK25



KYS30™



## PcBN

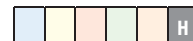
### Solid Inserts

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



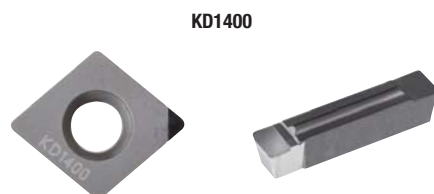
### Tipped Inserts

- 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.



## 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.



## How Do Catalog Numbers Work?

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

**Solid PCBN Inserts**  
Kennametal Negative Inserts

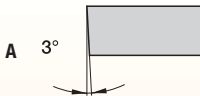
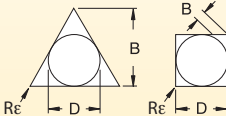
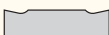
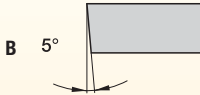
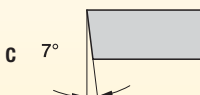
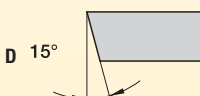
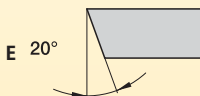
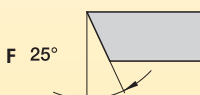
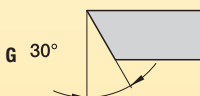
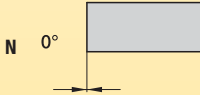
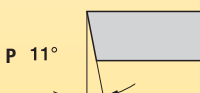
**CNGN**

Insert Number: CNGN332T0820

Material Selection Chart:

| Material        | Color  |
|-----------------|--------|
| Aluminum        | Blue   |
| Steel           | Red    |
| Inconel         | Green  |
| Titanium        | Yellow |
| Copper          | Purple |
| Brass           | Orange |
| Cast Iron       | Brown  |
| Stainless Steel | Grey   |
| Other           | White  |

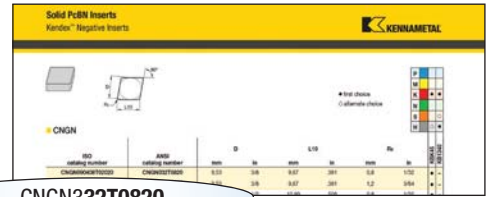
**CNGN332T0820**

| C                                                                                                                                                                    | N                                                                                                    | G                                                                                                                                                                                                                                                                       | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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| Insert Shape                                                                                                                                                         | Insert Clearance Angle                                                                               | Tolerance Class                                                                                                                                                                                                                                                         | Insert Features                                                                                                                                                                                                                                                                                                                                                                                                                                                                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| <div>H</div> Hexagon<br>120°                                                        | <div>A</div> 3°     | <div>Tolerances apply prior to edge prep and coating</div> <div></div> <div>D = Theoretical diameter of the insert inscribed circle<br/>S = Thickness<br/>B = See figures below</div> | <div>N</div>  <div>R</div>  <div>F</div>  <div>A</div>  <div>M</div>  <div>G</div>  <div>W</div>  <div>T</div>  <div>Q</div>  <div>U</div>  <div>B</div>  <div>H</div>  <div>C</div>  <div>J</div>  <div>X<br/>V</div> Special Design | <table><tr><th colspan="2"></th><th colspan="8">Code for inch cutting edge length "L10"</th></tr><tr><th colspan="2">"D"</th><th>inch</th><th>inch</th><th>C</th><th>D</th><th>R</th><th>S</th><th>T</th><th>V</th><th>W</th></tr><tr><td>1.2 (5)</td><td>5/32</td><td>S4</td><td>04</td><td>03</td><td>03</td><td>06</td><td>—</td><td>—</td><td></td><td></td></tr><tr><td>1.5 (6)</td><td>3/16</td><td>04</td><td>05</td><td>04</td><td>04</td><td>08</td><td>08</td><td>S3</td><td></td><td></td></tr><tr><td>1.8 (7)</td><td>7/32</td><td>05</td><td>06</td><td>05</td><td>05</td><td>09</td><td>09</td><td>03</td><td></td><td></td></tr><tr><td>—</td><td>.236</td><td>—</td><td>—</td><td>—</td><td>06</td><td>—</td><td>—</td><td>—</td><td></td><td></td></tr><tr><td>2</td><td>1/4</td><td>06</td><td>07</td><td>06</td><td>06</td><td>11</td><td>11</td><td>04</td><td></td><td></td></tr><tr><td>2.5</td><td>5/16</td><td>08</td><td>09</td><td>07</td><td>07</td><td>13</td><td>13</td><td>05</td><td></td><td></td></tr><tr><td>—</td><td>.315</td><td>—</td><td>—</td><td>—</td><td>08</td><td>—</td><td>—</td><td>—</td><td></td><td></td></tr><tr><td>3</td><td>3/8</td><td>09</td><td>11</td><td>09</td><td>09</td><td>16</td><td>16</td><td>06</td><td></td><td></td></tr><tr><td>—</td><td>.394</td><td>—</td><td>—</td><td>—</td><td>10</td><td>—</td><td>—</td><td>—</td><td></td><td></td></tr><tr><td>3.5</td><td>7/16</td><td>11</td><td>13</td><td>11</td><td>11</td><td>19</td><td>19</td><td>07</td><td></td><td></td></tr><tr><td>—</td><td>.472</td><td>—</td><td>—</td><td>—</td><td>12</td><td>—</td><td>—</td><td>—</td><td></td><td></td></tr><tr><td>4</td><td>1/2</td><td>12</td><td>15</td><td>12</td><td>12</td><td>22</td><td>22</td><td>08</td><td></td><td></td></tr><tr><td>4.5</td><td>9/16</td><td>14</td><td>17</td><td>14</td><td>14</td><td>24</td><td>24</td><td>09</td><td></td><td></td></tr><tr><td>5</td><td>5/8</td><td>16</td><td>19</td><td>15</td><td>15</td><td>27</td><td>27</td><td>10</td><td></td><td></td></tr><tr><td>—</td><td>.630</td><td>—</td><td>—</td><td>—</td><td>16</td><td>—</td><td>—</td><td>—</td><td></td><td></td></tr><tr><td>5.5</td><td>11/16</td><td>17</td><td>21</td><td>17</td><td>17</td><td>30</td><td>30</td><td>11</td><td></td><td></td></tr><tr><td>6</td><td>3/4</td><td>19</td><td>23</td><td>19</td><td>19</td><td>33</td><td>33</td><td>13</td><td></td><td></td></tr><tr><td>—</td><td>.787</td><td>—</td><td>—</td><td>—</td><td>20</td><td>—</td><td>—</td><td>—</td><td></td><td></td></tr><tr><td>7</td><td>7/8</td><td>22</td><td>27</td><td>22</td><td>22</td><td>38</td><td>38</td><td>15</td><td></td><td></td></tr><tr><td>—</td><td>.984</td><td>—</td><td>—</td><td>—</td><td>25</td><td>—</td><td>—</td><td>—</td><td></td><td></td></tr><tr><td>8</td><td>1</td><td>25</td><td>31</td><td>25</td><td>25</td><td>44</td><td>44</td><td>17</td><td></td><td></td></tr><tr><td>10</td><td>1-1/4</td><td>32</td><td>38</td><td>31</td><td>31</td><td>54</td><td>54</td><td>21</td><td></td><td></td></tr><tr><td>—</td><td>1.260</td><td>—</td><td>—</td><td>—</td><td>32</td><td>—</td><td>—</td><td>—</td><td></td><td></td></tr></table> |    |    | Code for inch cutting edge length "L10" |    |    |   |   |  |  |  | "D" |  | inch | inch | C | D | R | S | T | V | W | 1.2 (5) | 5/32 | S4 | 04 | 03 | 03 | 06 | — | — |  |  | 1.5 (6) | 3/16 | 04 | 05 | 04 | 04 | 08 | 08 | S3 |  |  | 1.8 (7) | 7/32 | 05 | 06 | 05 | 05 | 09 | 09 | 03 |  |  | — | .236 | — | — | — | 06 | — | — | — |  |  | 2 | 1/4 | 06 | 07 | 06 | 06 | 11 | 11 | 04 |  |  | 2.5 | 5/16 | 08 | 09 | 07 | 07 | 13 | 13 | 05 |  |  | — | .315 | — | — | — | 08 | — | — | — |  |  | 3 | 3/8 | 09 | 11 | 09 | 09 | 16 | 16 | 06 |  |  | — | .394 | — | — | — | 10 | — | — | — |  |  | 3.5 | 7/16 | 11 | 13 | 11 | 11 | 19 | 19 | 07 |  |  | — | .472 | — | — | — | 12 | — | — | — |  |  | 4 | 1/2 | 12 | 15 | 12 | 12 | 22 | 22 | 08 |  |  | 4.5 | 9/16 | 14 | 17 | 14 | 14 | 24 | 24 | 09 |  |  | 5 | 5/8 | 16 | 19 | 15 | 15 | 27 | 27 | 10 |  |  | — | .630 | — | — | — | 16 | — | — | — |  |  | 5.5 | 11/16 | 17 | 21 | 17 | 17 | 30 | 30 | 11 |  |  | 6 | 3/4 | 19 | 23 | 19 | 19 | 33 | 33 | 13 |  |  | — | .787 | — | — | — | 20 | — | — | — |  |  | 7 | 7/8 | 22 | 27 | 22 | 22 | 38 | 38 | 15 |  |  | — | .984 | — | — | — | 25 | — | — | — |  |  | 8 | 1 | 25 | 31 | 25 | 25 | 44 | 44 | 17 |  |  | 10 | 1-1/4 | 32 | 38 | 31 | 31 | 54 | 54 | 21 |  |  | — | 1.260 | — | — | — | 32 | — | — | — |  |  |
|                                                                                                                                                                      |                                                                                                      |                                                                                                                                                                                                                                                                         | Code for inch cutting edge length "L10"                                                                                                                                                                                                                                                                                                                                                                                                                                        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| "D"                                                                                                                                                                  |                                                                                                      |                                                                                                                                                                                                                                                                         | inch                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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                                                     | C  | D  | R                                       | S  | T  | V | W |  |  |  |     |  |      |      |   |   |   |   |   |   |   |         |      |    |    |    |    |    |   |   |  |  |         |      |    |    |    |    |    |    |    |  |  |         |      |    |    |    |    |    |    |    |  |  |   |      |   |   |   |    |   |   |   |  |  |   |     |    |    |    |    |    |    |    |  |  |     |      |    |    |    |    |    |    |    |  |  |   |      |   |   |   |    |   |   |   |  |  |   |     |    |    |    |    |    |    |    |  |  |   |      |   |   |   |    |   |   |   |  |  |     |      |    |    |    |    |    |    |    |  |  |   |      |   |   |   |    |   |   |   |  |  |   |     |    |    |    |    |    |    |    |  |  |     |      |    |    |    |    |    |    |    |  |  |   |     |    |    |    |    |    |    |    |  |  |   |      |   |   |   |    |   |   |   |  |  |     |       |    |    |    |    |    |    |    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| 1.2 (5)                                                                                                                                                              | 5/32                                                                                                 |                                                                                                                                                                                                                                                                         | S4                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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| 1.5 (6)                                                                                                                                                              | 3/16                                                                                                 |                                                                                                                                                                                                                                                                         | 04                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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| 1.8 (7)                                                                                                                                                              | 7/32                                                                                                 |                                                                                                                                                                                                                                                                         | 05                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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| <div>P</div> Pentagon<br>108°                                                      | <div>B</div> 5°     |                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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| <div>R</div> Round<br>—                                                           | <div>C</div> 7°    |                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| <div>S</div> Square<br>90°                                                        | <div>D</div> 15°  |                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| <div>T</div> Triangular<br>60°                                                    | <div>E</div> 20°  |                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| <div>C<br/>D<br/>E<br/>M<br/>V</div> Rhomboid<br>80°<br>55°<br>75°<br>86°<br>35°  | <div>F</div> 25°  |                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| <div>W</div> Trigon<br>80°<br>with enlarged<br>corner angles                      | <div>G</div> 30°  |                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| <div>L</div> Rectangular<br>90°                                                   | <div>N</div> 0°   |                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| <div>A<br/>B<br/>N/K</div> Parallelogram<br>85°<br>82°<br>55°                     | <div>P</div> 11°  |                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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|                                                                                                                                                                      | <div>O</div> For other clearance angles requiring descriptions.                                      |                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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| tolerance class* | tolerance on "D"        | tolerance on "B" | tolerance on "S" |
|------------------|-------------------------|------------------|------------------|
| C                | ±.0010"                 | ±.0005"          | ±.001"           |
| H                | ±.0005"                 | ±.0005"          | ±.001"           |
| E                | ±.0010"                 | ±.0010"          | ±.001"           |
| G                | ±.0010"                 | ±.0010"          | ±.005"           |
| M                | See tables on next page |                  | ±.005"           |
| U                | See tables on next page |                  | ±.005"           |

\*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.



CNGN332T0820

| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2                     |                              | T                          | 08                         | 20                         |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
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| Thickness<br>"S"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Corner<br>Radius "Re" | Hand of Insert<br>(optional) | Cutting Edge<br>(optional) | T-Land Width<br>(optional) | T-Land Angle<br>(optional) | Tip<br>Style<br>(optional) | Chipbreaker<br>(optional) |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| <table border="1"> <thead> <tr> <th>symbol</th> <th>thick-<br/>ness</th> </tr> <tr> <th>inch</th> <th>inch</th> </tr> </thead> <tbody> <tr><td>.5 (1)</td><td>1/32</td></tr> <tr><td>.6</td><td>.040</td></tr> <tr><td>1 (2)</td><td>1/16</td></tr> <tr><td>1.2</td><td>5.64</td></tr> <tr><td>1.5 (3)</td><td>3/32</td></tr> <tr><td>2</td><td>1/8</td></tr> <tr><td>2.5</td><td>5/32</td></tr> <tr><td>3</td><td>3/16</td></tr> <tr><td>3.5</td><td>7/32</td></tr> <tr><td>4</td><td>1/4</td></tr> <tr><td>5</td><td>5/16</td></tr> <tr><td>6</td><td>3/8</td></tr> <tr><td>7</td><td>7/16</td></tr> <tr><td>8</td><td>1/2</td></tr> </tbody> </table> | symbol                | thick-<br>ness               | inch                       | inch                       | .5 (1)                     | 1/32                       | .6                        | .040 | 1 (2) | 1/16 | 1.2 | 5.64 | 1.5 (3) | 3/32 | 2 | 1/8 | 2.5 | 5/32 | 3 | 3/16 | 3.5 | 7/32 | 4 | 1/4 | 5 | 5/16 | 6 | 3/8 | 7 | 7/16 | 8 | 1/2 | <table border="1"> <thead> <tr> <th>symbol</th> <th>corner<br/>radius</th> </tr> <tr> <th>inch</th> <th>inch</th> </tr> </thead> <tbody> <tr><td>X0</td><td>.0015</td></tr> <tr><td>0</td><td>.004</td></tr> <tr><td>.5</td><td>.008</td></tr> <tr><td>1</td><td>1/64</td></tr> <tr><td>2</td><td>1/32</td></tr> <tr><td>3</td><td>3/64</td></tr> <tr><td>4</td><td>1/16</td></tr> <tr><td>5</td><td>5/64</td></tr> <tr><td>6</td><td>3/32</td></tr> <tr><td>7</td><td>7/64</td></tr> <tr><td>8</td><td>1/8</td></tr> <tr><td>—</td><td>round<br/>insert</td></tr> </tbody> </table> | symbol | corner<br>radius | inch | inch | X0 | .0015 | 0 | .004 | .5 | .008 | 1 | 1/64 | 2 | 1/32 | 3 | 3/64 | 4 | 1/16 | 5 | 5/64 | 6 | 3/32 | 7 | 7/64 | 8 | 1/8 | — | round<br>insert | <p>R = Right hand</p> <p>L = Left hand</p> <p>N = Neutral</p> | <p>F*  Sharp</p> <p>E  Rounded</p> <p>T*  Chamfered</p> <p>S*  Chamfered and Rounded</p> <p>K  Double-Chamfered</p> <p>P  Double-Chamfered and Rounded</p> <p>*Also available in wiper style.</p> | <table border="1"> <thead> <tr> <th>symbol</th> <th>inch</th> </tr> <tr> <th>ANSI</th> <th>size</th> </tr> </thead> <tbody> <tr><td>04</td><td>.004</td></tr> <tr><td>08</td><td>.008</td></tr> </tbody> </table> | symbol | inch | ANSI | size | 04 | .004 | 08 | .008 | <table border="1"> <thead> <tr> <th>symbol</th> <th>size</th> </tr> </thead> <tbody> <tr><td>10</td><td>10°</td></tr> <tr><td>15</td><td>15°</td></tr> <tr><td>20</td><td>20°</td></tr> <tr><td>25</td><td>25°</td></tr> <tr><td>30</td><td>30°</td></tr> </tbody> </table> | symbol | size | 10 | 10° | 15 | 15° | 20 | 20° | 25 | 25° | 30 | 30° | <p>FW = Finishing Wiper</p> <p>MW = Medium Wiper</p> <table border="1"> <thead> <tr> <th>symbol</th> <th>usage</th> </tr> </thead> <tbody> <tr><td>C</td><td>full top</td></tr> <tr><td>M</td><td>mini tip</td></tr> <tr><td>MT</td><td>multi-tip</td></tr> <tr><td>ST</td><td>single tip</td></tr> </tbody> </table> | symbol | usage | C | full top | M | mini tip | MT | multi-tip | ST | single tip |
| symbol                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | thick-<br>ness        |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| inch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | inch                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| .5 (1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1/32                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| .6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | .040                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 1 (2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1/16                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 1.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 5.64                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 1.5 (3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3/32                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1/8                   |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 2.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 5/32                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3/16                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 3.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 7/32                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1/4                   |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 5/16                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3/8                   |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 7/16                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1/2                   |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| symbol                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | corner<br>radius      |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| inch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | inch                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| X0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | .0015                 |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | .004                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| .5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | .008                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1/64                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1/32                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3/64                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1/16                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 5/64                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3/32                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 7/64                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1/8                   |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| —                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | round<br>insert       |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| symbol                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | inch                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| ANSI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | size                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 04                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | .004                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 08                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | .008                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| symbol                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | size                  |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 10°                   |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 15°                   |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 20°                   |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 25°                   |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 30°                   |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| symbol                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | usage                 |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | full top              |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| M                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | mini tip              |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| MT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | multi-tip             |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |
| ST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | single tip            |                              |                            |                            |                            |                            |                           |      |       |      |     |      |         |      |   |     |     |      |   |      |     |      |   |     |   |      |   |     |   |      |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                  |      |      |    |       |   |      |    |      |   |      |   |      |   |      |   |      |   |      |   |      |   |      |   |     |   |                 |                                                               |                                                                                                                                                                                                   |                                                                                                                                                                                                                   |        |      |      |      |    |      |    |      |                                                                                                                                                                                                                                                                             |        |      |    |     |    |     |    |     |    |     |    |     |                                                                                                                                                                                                                                                                                                                       |        |       |   |          |   |          |    |           |    |            |

| "D"   | ± Tolerance on "D"     |         |         |                   |
|-------|------------------------|---------|---------|-------------------|
|       | Class M Tolerance      |         |         | Class U Tolerance |
|       | Shapes S, T, C, R, & W | Shape D | Shape V | Shapes S, T, & C  |
| inch  | inch                   | inch    | inch    | inch              |
| 5/32  | .002                   | —       | —       | —                 |
| 3/16  | .002                   | —       | —       | .003              |
| 7/32  | .002                   | .002    | .002    | .003              |
| 1/4   | .002                   | .002    | .002    | .003              |
| 5/16  | .002                   | .002    | .002    | .003              |
| 3/8   | .002                   | .002    | .002    | .003              |
| 7/16  | .003                   | .003    | .003    | .005              |
| 1/2   | .003                   | .003    | .003    | .005              |
| 9/16  | .003                   | .003    | .003    | .005              |
| 5/8   | .004                   | .004    | .004    | .007              |
| 11/16 | .004                   | .004    | .004    | .007              |
| 3/4   | .004                   | .004    | .004    | .007              |
| 7/8   | .005                   | —       | —       | .010              |
| 1     | .005                   | —       | —       | .010              |
| 1 1/4 | .006                   | —       | —       | .010              |

| "D"   | ± Tolerance on "B"     |         |         |                   |
|-------|------------------------|---------|---------|-------------------|
|       | Class M Tolerance      |         |         | Class U Tolerance |
|       | Shapes S, T, C, R, & W | Shape D | Shape V | Shapes S, T, & C  |
| inch  | inch                   | inch    | inch    | inch              |
| 5/32  | .003                   | —       | —       | —                 |
| 3/16  | .003                   | —       | —       | .005              |
| 7/32  | .003                   | .004    | —       | .005              |
| 1/4   | .003                   | .004    | —       | .005              |
| 5/16  | .003                   | .004    | —       | .005              |
| 3/8   | .003                   | .004    | .007    | .005              |
| 7/16  | .005                   | .006    | —       | —                 |
| 1/2   | .005                   | .006    | .010    | .008              |
| 9/16  | .005                   | .006    | —       | —                 |
| 5/8   | .006                   | .007    | —       | .011              |
| 11/16 | .006                   | .007    | —       | .011              |
| 3/4   | .006                   | .007    | —       | .011              |
| 7/8   | .006                   | —       | —       | .015              |
| 1     | .007                   | —       | —       | .015              |
| 1 1/4 | .008                   | —       | —       | .015              |

# ➤ Advanced Materials for Cast Iron Machining



## Primary Application

The Kennametal advanced materials, utilizing Beyond™ technology, offer greater wear resistance and toughness, depending on the job.

KYK ceramic inserts are the first choice for high-speed, continuous, and lightly interrupted turning applications in cast iron materials. Benefits include improved fracture toughness, better wear resistance, and an extended application range. Combining grades KYK10™ and CVD-coated KYK25™ with our other ceramic grades for cast iron, Kennametal provides a complete high-performance ceramic portfolio that can reduce machining cycle times and lower manufacturing costs.

The Kennametal SiAlON grades, such as KYK10, can be applied at high cutting speeds up to the PcBN range and at varying cast iron material machinability. Combining SiAlON material science, CVD coating technology, and PcBN grades for cast iron machining, Kennametal provides a complete high-performance portfolio that can reduce cycle time and lower machining costs.

## Features and Benefits

### Solid PcBN Inserts

#### KBK45™ Grade

- Designed for elevated abrasion-resistance.
- Go-to grade for cost-per-part manufacturing.
- For roughing and finishing.
- Gold color for improved usage monitoring.

#### KB1340™ Grade

- Designed for elevated abrasion-resistance.
- High-temperature resistance.
- For roughing and finishing.

### Tipped PcBN Inserts

#### KB5630™ Grade

- Laminated material for fine finishing.
- Excellent edge stability.
- PVD coating for reliable tool life, even at varying material machinability.

#### KB1345™ Grade

- Abrasion-resistant high CBN content tipped grade.
- Very fine PcBN structure suitable for fine finishing applications.

**KBK45™** grade provides the best cost-per-part in cast irons.

**KB5630™** grade has greater abrasion resistance for chilled and hardened irons.



## Ceramic Inserts

### **KYK10™ Grade**

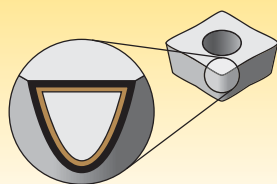
- Improved wear resistance and toughness with up to 20% longer tool life than current KY1310™ grade.
- Best suited for continuous turning of cast iron materials and in lightly interrupted cuts.

### **KYK25™ Grade**

- 12-micron thick coating provides excellent wear resistance, and pre-coat treatment allows for very consistent tool life and performance in cast iron applications.
- Up to 30% longer tool life vs. competitors' CVD-coated ceramic grades.

### **KY3500™ Grade**

- Excellent for roughing to finishing operations in wet or dry cuts with speeds up to 320 SFM (1000 m/min).
- Performs well in difficult interrupted cuts in ductile or malleable cast iron (<70 KSI tensile strength) at speeds of 85–160 SFM (250–450 m/min).



Coatings provide high-speed capability and are engineered for finishing to light roughing.

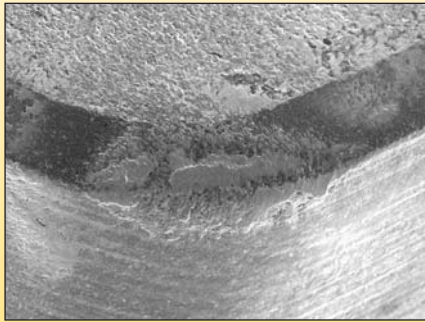
|   |                    |
|---|--------------------|
| P | Steel              |
| M | Stainless Steel    |
| K | Cast Iron          |
| N | Non-Ferrous        |
| S | High-Temp Alloys   |
| H | Hardened Materials |

wear resistance ← → toughness

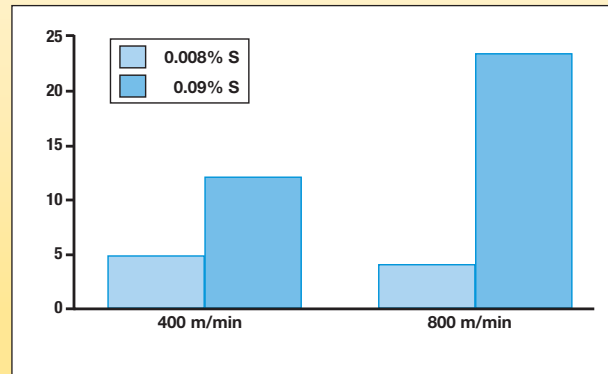
| Coating            |        | Grade Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|--------------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----|----|----|----|----|----|----|----|----|
| Solid PcbN Grades  | KBK45  | <b>Composition:</b> A PVD TiN coated high CBN content, solid PcbN insert having multiple cutting edges.<br><b>Application:</b> Applied in roughing to finishing of gray and hard cast irons. Also used for finishing chilled cast iron and fully pearlitic cast iron. The solid PcbN insert offers better security and shock resistance compared to tipped PcbN inserts, while also enabling deeper depth-of-cut capabilities.                                                                                                |   |    |    |    |    |    |    |    |    |    |
|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | K |    |    |    |    |    |    |    |    |    |
|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |    |    |    |    |    |    |    |    |    |
| Solid PcbN Grades  | KB1340 | <b>Composition:</b> A high CBN content, solid PcbN insert having multiple cutting edges.<br><b>Application:</b> Applied in roughing to finishing of fully pearlitic gray cast iron, chilled irons, high-chrome alloyed steels, and heavy cuts in hardened steels (>45 HRC). The solid PcbN insert offers better security and shock resistance compared to tipped PcbN inserts, while also enabling deeper depth-of-cut capabilities.                                                                                          |   |    |    |    |    |    |    |    |    |    |
|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | K |    |    |    |    |    |    |    |    |    |
|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |    |    |    |    |    |    |    |    |    |
| Tipped PcbN Grades | KB1345 | <b>Composition:</b> A high CBN content, PcbN tip brazed onto a carbide insert.<br><b>Application:</b> Applied in roughing to finishing of fully pearlitic gray cast iron, chilled irons, high-chrome alloyed steels, sintered powdered metals, and heavy cuts in hardened steels (>45 HRC). Also used for finishing chilled cast iron and fully pearlitic cast iron. The tipped PcbN insert is available in a wide range of insert styles including positive rake geometries that are ideally suited for boring applications. |   |    |    |    |    |    |    |    |    |    |
|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | K |    |    |    |    |    |    |    |    |    |
|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | H |    |    |    |    |    |    |    |    |    |
| Tipped PcbN Grades | KB5630 | <b>Composition:</b> A high content PcbN with a PVD AlTiN coating for added wear resistance.<br><b>Application:</b> Designed for roughing to finishing of hardened steels (>45 HRC), abrasive workpiece materials such as sintered valve seat materials, powder metallurgy steels, and hard high-alloy cast irons. The PVD coating provides resistance to crater wear and increased resistance to chipping. A wide range of styles are available, including Screw-On geometries that are ideal for boring applications.        |   |    |    |    |    |    |    |    |    |    |
|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | K |    |    |    |    |    |    |    |    |    |
|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | S |    |    |    |    |    |    |    |    |    |
| Ceramic Grades     | KYK10  | <b>Composition:</b> An advanced SiAlON ceramic grade.<br><b>Application:</b> Provides maximum wear resistance. Used for high-speed continuous turning of gray cast iron, including through scale. To be used for varying cast iron machinability.                                                                                                                                                                                                                                                                             |   |    |    |    |    |    |    |    |    |    |
|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | K |    |    |    |    |    |    |    |    |    |
|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |    |    |    |    |    |    |    |    |    |
| Ceramic Grades     | KYK25  | <b>Composition:</b> Pure silicon nitride ceramic with an alumina CVD coating.<br><b>Application:</b> Excellent combination of toughness and edge wear resistance. Used for general purpose machining of gray, ductile, or nodular cast irons. To be used for varying cast iron machinability.                                                                                                                                                                                                                                 |   |    |    |    |    |    |    |    |    |    |
|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | K |    |    |    |    |    |    |    |    |    |
|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |    |    |    |    |    |    |    |    |    |
| Ceramic Grades     | KY3500 | <b>Composition:</b> Pure silicon nitride grade.<br><b>Application:</b> Maximum toughness. Used at high feed rates for rough machining of gray cast iron, including machining through interruptions.                                                                                                                                                                                                                                                                                                                           |   |    |    |    |    |    |    |    |    |    |
|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | K |    |    |    |    |    |    |    |    |    |
|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |    |    |    |    |    |    |    |    |    |

## ■ Machinability of Cast Iron

- Unaged casting is difficult to machine and leads to shorter tool life.
- Low sulfur content leads to shorter tool life.
- High titanium content decreases the tool life significantly.
- Increased ferrite content leads to high chemical wear and a substantially shorter tool life.
- Compacted graphite cast iron shows high chemical wear.



Proper application of KB1340™ — formation of protective layer; tool life should exceed 70 km sliding distance.

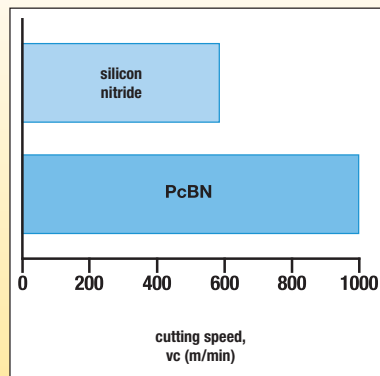


Comparison of the life of PcBN cutting tools in machining two different gray cast irons, primarily differing in sulfur content.

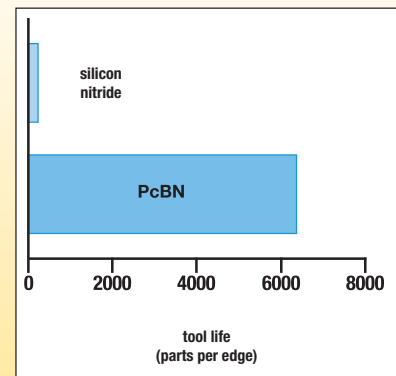
## ■ Gray Cast Iron Brake Disk Machining • Ceramic vs. PcBN



(a)



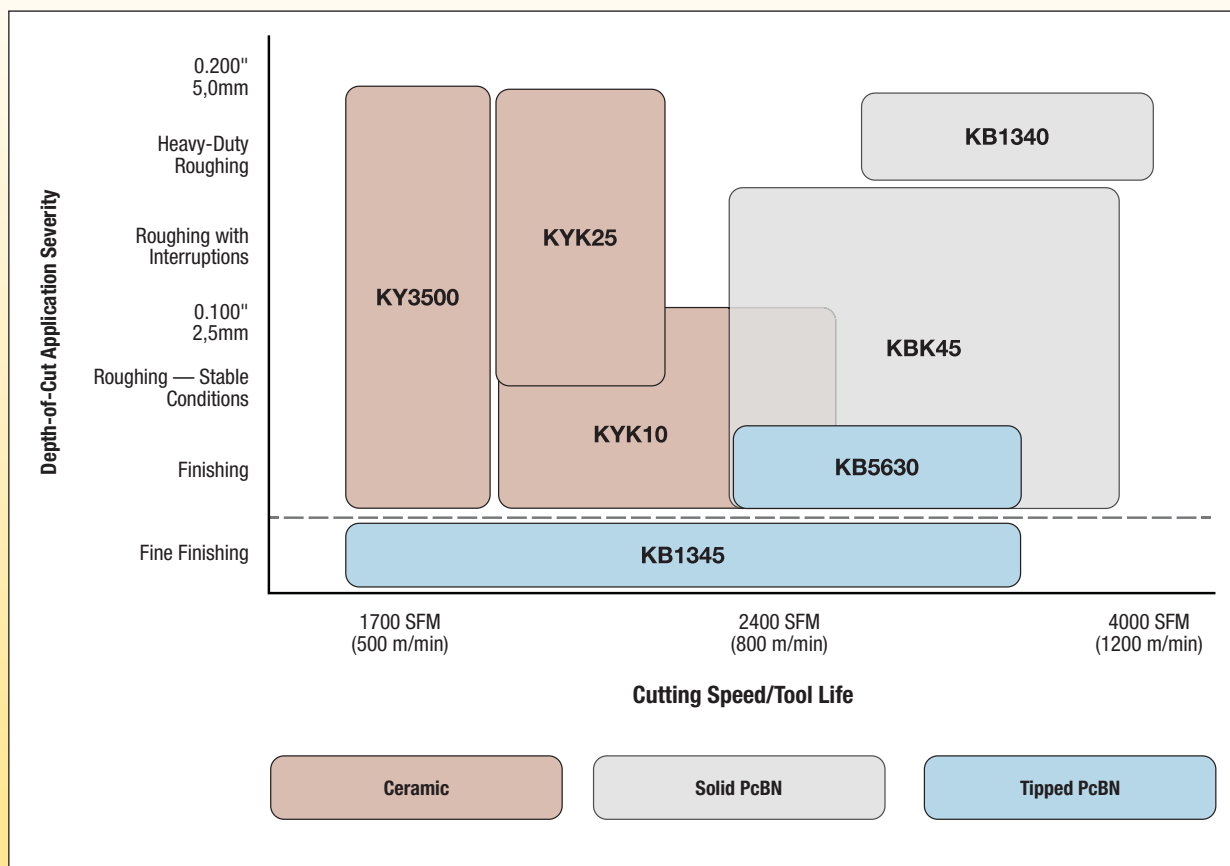
(b)



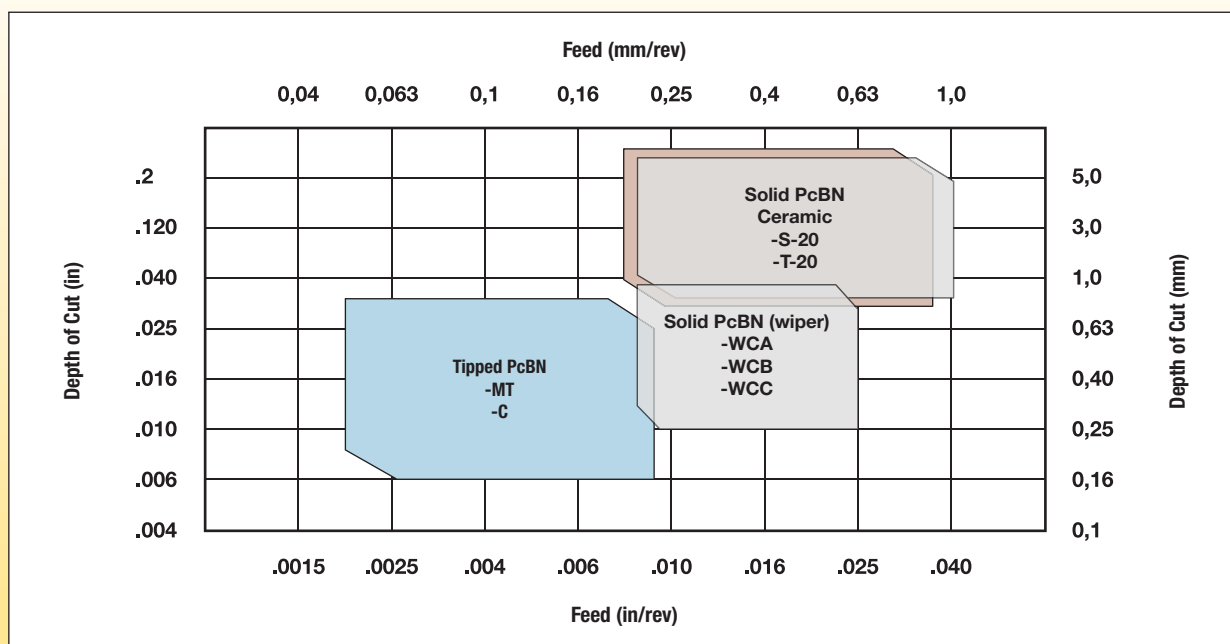
(c)

PcBN increases productivity when machining gray iron brake disks (a) in terms of cutting speed (b) and tool life (c) compared to silicon nitride ceramic.

### Select the Cutting Material



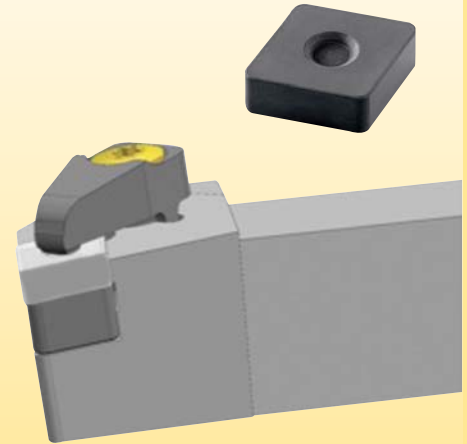
### Depth of Cut



## ■ Dimple Clamps for Added Stability

### Typical Application

Continuous cost pressures force manufacturers of gray cast iron brake disks to look for cost-cutting solutions. CBN inserts deliver high productivity and long tool life. Kennametal has developed the solid, high-content grade KB1340™, which provides superior performance when machining gray cast iron components, such as brake disks or fly wheels. To ensure secure seating in the toolholder, the inserts are available with dimple-design clamping. The clamps fit Ceramtec holders, which makes the conversion to Kennametal tooling easier.



### Higher Productivity and Profitability

- Ensures tight and rigid clamping.
- Dimpled insert with special clamping provides increased stability in the pocket.
- Ideal for use in heavy-duty machining applications.
- Cladded clamps for improved resistance against chip wash are available upon request.
- The shallow dimple design enables the use of less expensive 3/16" (4,76mm) inserts.
- Round dimple design works with custom tooling where clamping direction must be offset due to space limitations.

## ■ Clamp Selection Chart

| insert              |                    | clamp               |              |
|---------------------|--------------------|---------------------|--------------|
| ANSI Catalog Number | ISO Catalog Number | Catalog Number      | Order Number |
| CNGX433S0415        | CNGX120412S01015   | 551.718–100° Corner | 3968904      |
| CNGX433S0415FW      | CNGX120412S01015FW | 551.718–100° Corner | 3968904      |
| CNGX434S0820        | CNGX120416S02020   | 551.718–100° Corner | 3968904      |
| CNGF432             | CNGF120408         | 551.718–100° Corner | 3968904      |
| DNGX434S0820        | DNGX150416S02020   | 551.720             | 4094234      |
| SNGX434S0820        | SNGX120416S02020   | 551.718             | 3968904      |
| SNGX534S0820        | SNGX150416S02020   | 551.718             | 3968904      |
| VNGX333S0820        | VNGX160412S02020   | 551.721             | 4094236      |
| TNGX333EFW          | TNGX160412EFW      | 551.733             | 4094235      |

## ■ Wipers for Cast Iron Machining

### WCA

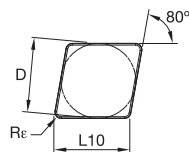
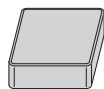
Wiper for cast iron machining for a feed rate up to  $f = 0.010/\text{rev}$  (0,25mm/rev).

### WCB

Wiper for cast iron machining for a feed rate up to  $f = 0.018/\text{rev}$  (0,45mm/rev).

### WCC

Wiper for cast iron machining for a feed rate up to  $f = 0.025/\text{rev}$  (0,65mm/rev).

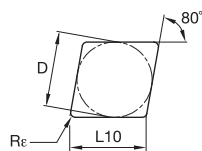


- first choice
- alternate choice

|   |   |   |   |
|---|---|---|---|
| P |   |   |   |
| M |   |   |   |
| K | ● | ● |   |
| N |   |   |   |
| S |   |   | ○ |
| H |   | ○ | ● |

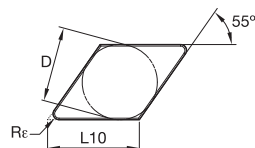
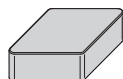
### ■ CNGN

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KBK45 | KB1340 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |       |        |
| CNGN090408T02020      | CNGN332T0820           | 9,53  | 3/8 | 9,67  | .381 | 0,8 | 1/32 | ●     | -      |
| CNGN090412S02020      | CNGN333S0820           | 9,53  | 3/8 | 9,67  | .381 | 1,2 | 3/64 | ●     | -      |
| CNGN120408T02020      | CNGN432T0820           | 12,70 | 1/2 | 12,90 | .508 | 0,8 | 1/32 | ●     | -      |
| CNGN120412S02020      | CNGN433S0820           | 12,70 | 1/2 | 12,90 | .508 | 1,2 | 3/64 | ●     | -      |
| CNGN120416S02020      | CNGN434S0820           | 12,70 | 1/2 | 12,90 | .508 | 1,6 | 1/16 | ●     | -      |



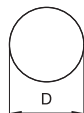
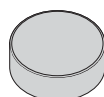
### ■ CNMN/CNM

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KBK45 | KB1340 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |       |        |
| CNMN120408S02020      | CNM432S0820            | 12,70 | 1/2 | 12,90 | .508 | 0,8 | 1/32 | -     | ●      |
| CNMN120412S02020      | CNM433S0820            | 12,70 | 1/2 | 12,90 | .508 | 1,2 | 3/64 | -     | ●      |



### ■ DNGN

| ISO<br>catalog number | ANSI<br>catalog number | D     |      | L10   |      | Rε  |      | KBK45 | KB1340 |
|-----------------------|------------------------|-------|------|-------|------|-----|------|-------|--------|
|                       |                        | mm    | in   | mm    | in   | mm  | in   |       |        |
| DNGN120408S02020      | DNGN120408S02020       | 10,00 | .394 | 12,21 | .481 | 0,8 | 1/32 | ●     | -      |
| DNGN120412S02020      | DNGN120412S02020       | 10,00 | .394 | 12,21 | .481 | 1,2 | 3/64 | ●     | -      |



### ■ RNGN

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10 |    | Rε |    | KBK45 | KB1340 |
|-----------------------|------------------------|-------|-----|-----|----|----|----|-------|--------|
|                       |                        | mm    | in  | mm  | in | mm | in |       |        |
| RNGN090400S02020      | RNGN33S0820            | 9,53  | 3/8 | —   | —  | —  | —  | ●     | -      |
| RNGN120400S02020      | RNGN43S0820            | 12,70 | 1/2 | —   | —  | —  | —  | ●     | -      |



- first choice
- alternate choice

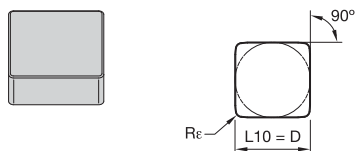
|   |   |   |  |
|---|---|---|--|
| P |   |   |  |
| M |   |   |  |
| K | ● | ● |  |
| N |   |   |  |
| S |   | ○ |  |
| H | ○ | ● |  |

ISO/ANSI Turning

### RNMN/RNM

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10 |    | R <sub>ε</sub> |    | KBK45 | KB1340 |
|-----------------------|------------------------|-------|-----|-----|----|----------------|----|-------|--------|
|                       |                        | mm    | in  | mm  | in | mm             | in |       |        |
| RNMN090300S02020      | RNM32S0820             | 9,53  | 3/8 | —   | —  | —              | —  | —     | ●      |
| RNMN120300S02020      | RNM42S0820             | 12,70 | 1/2 | —   | —  | —              | —  | —     | ●      |
| RNMN120400S02020      | RNM43S0820             | 12,70 | 1/2 | —   | —  | —              | —  | —     | ●      |

## Kendex™ Positive Inserts

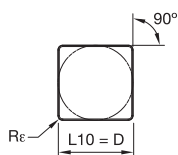


- first choice
- alternate choice

|   |   |   |  |
|---|---|---|--|
| P |   |   |  |
| M |   |   |  |
| K | ● | ● |  |
| N |   |   |  |
| S |   | ○ |  |
| H | ○ | ● |  |

### SNGN

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | R <sub>ε</sub> |      | KBK45 | KB1340 |
|-----------------------|------------------------|-------|-----|-------|------|----------------|------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm             | in   |       |        |
| SNGN120408T02020      | SNGN432T0820           | 12,70 | 1/2 | 12,70 | .500 | 0,8            | 1/32 | ●     | —      |
| SNGN120412S02020      | SNGN433S0820           | 12,70 | 1/2 | 12,70 | .500 | 1,2            | 3/64 | ●     | —      |
| SNGN120416S02020      | SNGN434S0820           | 12,70 | 1/2 | 12,70 | .500 | 1,6            | 1/16 | ●     | —      |

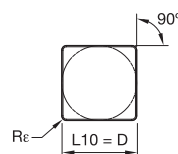


- first choice
- alternate choice

|   |   |   |  |
|---|---|---|--|
| P |   |   |  |
| M |   |   |  |
| K | ● | ● |  |
| N |   |   |  |
| S |   | ○ |  |
| H | ○ | ● |  |

■ SNGN-WCB

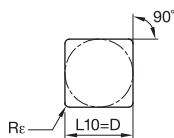
| ISO<br>catalog number | ANSI<br>catalog number | D    |     | L10  |      | Re  |      | KBK45 | KB1340 |
|-----------------------|------------------------|------|-----|------|------|-----|------|-------|--------|
|                       |                        | mm   | in  | mm   | in   | mm  | in   |       |        |
| SNGN090408S01015WCB   | SNGN332S0415WCB        | 9,53 | 3/8 | 9,52 | .375 | 0,8 | 1/32 | ●     | -      |



■ SNGN-WCC

| ISO<br>catalog number | ANSI<br>catalog number | D    |     | L10  |      | Re  |      | KBK45 | KB1340 |
|-----------------------|------------------------|------|-----|------|------|-----|------|-------|--------|
|                       |                        | mm   | in  | mm   | in   | mm  | in   |       |        |
| SNGN090408S01015WCC   | SNGN332S0415WCC        | 9,53 | 3/8 | 9,53 | .375 | 0,8 | 1/32 | ●     | -      |

Kendex™ Negative Inserts

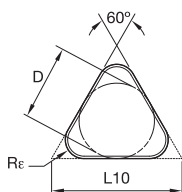


- first choice
- alternate choice

|   |   |   |  |
|---|---|---|--|
| P |   |   |  |
| M |   |   |  |
| K | ● | ● |  |
| N |   |   |  |
| S |   | ○ |  |
| H | ○ | ● |  |

■ SNMN/SNM

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Re  |      | KBK45 | KB1340 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |       |        |
| SNMN090308S02020      | SNM322S0820            | 9,53  | 3/8 | 9,53  | .375 | 0,8 | 1/32 | -     | ●      |
| SNMN090316S02020      | SNM324S0820            | 9,53  | 3/8 | 9,53  | .375 | 1,6 | 1/16 | -     | ●      |
| SNMN120316S02020      | SNM424S0820            | 12,70 | 1/2 | 12,70 | .500 | 1,6 | 1/16 | -     | ●      |
| SNMN120416T02020      | SNM434S0820            | 12,70 | 1/2 | 12,70 | .500 | 1,6 | 1/16 | -     | ●      |

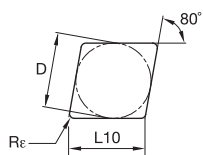
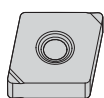


■ TNGN

| ISO<br>catalog number | ANSI<br>catalog number | D    |     | L10   |      | Re  |      | KBK45 | KB1340 |
|-----------------------|------------------------|------|-----|-------|------|-----|------|-------|--------|
|                       |                        | mm   | in  | mm    | in   | mm  | in   |       |        |
| TNGN110416S02020      | TNGN234S0820           | 6,35 | 1/4 | 11,00 | .433 | 1,6 | 1/16 | ●     | -      |
| TNGN160416S02020      | TNGN334S0820           | 9,53 | 3/8 | 16,50 | .650 | 1,6 | 1/16 | ●     | -      |

|   |   |   |   |
|---|---|---|---|
| P |   |   |   |
| M |   |   |   |
| K | ● | ● | ● |
| N |   |   |   |
| S |   |   | ○ |
| H |   | ○ | ● |

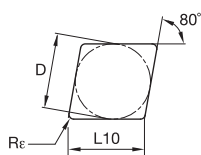
ISO/ANSI Turning



- first choice
- alternate choice

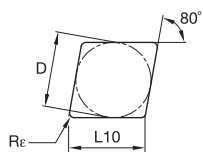
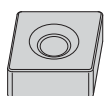
### ■ CNGF

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KBK45 | KB1340 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |       |        |
| CNGF120408            | CNGF432                | 12,70 | 1/2 | 12,90 | .508 | 0,8 | 1/32 | -     | ●      |



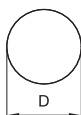
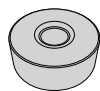
### ■ CNGX

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KBK45 | KB1340 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |       |        |
| CNGX120408T02020      | CNGX432T0820           | 12,70 | 1/2 | 12,90 | .508 | 0,8 | 1/32 | ●     | -      |
| CNGX120412S01015      | CNGX433S0415           | 12,70 | 1/2 | 12,90 | .508 | 1,2 | 3/64 | -     | ●      |
| CNGX120412S02020      | CNGX433S0820           | 12,70 | 1/2 | 12,90 | .508 | 1,2 | 3/64 | ●     | -      |
| CNGX120416S02020      | CNGX434S0820           | 12,70 | 1/2 | 12,90 | .508 | 1,6 | 1/16 | ●     | ●      |



### ■ CNGX-FW

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KBK45 | KB1340 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |       |        |
| CNGX120412S01015FW    | CNGX433S0415FW         | 12,70 | 1/2 | 12,90 | .508 | 1,2 | 3/64 | -     | ●      |



### ■ RNGX

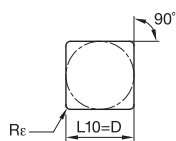
| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10 |    | Rε |    | KBK45 | KB1340 |
|-----------------------|------------------------|-------|-----|-----|----|----|----|-------|--------|
|                       |                        | mm    | in  | mm  | in | mm | in |       |        |
| RNGX120400S02020      | RNGX43S0820            | 12,70 | 1/2 | -   | -  | -  | -  | ●     | -      |

# Solid PcBN Inserts

Kendex™ Negative Dimple Inserts



ISO/ANSI Turning

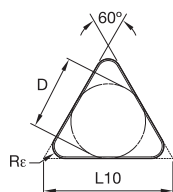
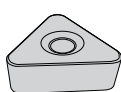


- first choice
- alternate choice

|   |   |   |  |
|---|---|---|--|
| P |   |   |  |
| M |   |   |  |
| K | ● | ● |  |
| N |   |   |  |
| S |   | ○ |  |
| H | ○ | ● |  |

## SNGX

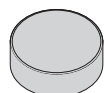
| ISO catalog number | ANSI catalog number | D     |     | L10   |      | Rε  |      | KBK45 | KB1340 |
|--------------------|---------------------|-------|-----|-------|------|-----|------|-------|--------|
|                    |                     | mm    | in  | mm    | in   | mm  | in   |       |        |
| SNGX120408T02020   | SNGX432T0820        | 12,70 | 1/2 | 12,70 | .500 | 0,8 | 1/32 | ●     | -      |
| SNGX120412S02020   | SNGX433S0820        | 12,70 | 1/2 | 12,70 | .500 | 1,2 | 3/64 | ●     | -      |
| SNGX120416S02020   | SNGX434S0820        | 12,70 | 1/2 | 12,70 | .500 | 1,6 | 1/16 | ●     | ●      |



## TNGX

| ISO catalog number | ANSI catalog number | D    |     | L10   |      | Rε  |      | KBK45 | KB1340 |
|--------------------|---------------------|------|-----|-------|------|-----|------|-------|--------|
|                    |                     | mm   | in  | mm    | in   | mm  | in   |       |        |
| TNGX160416S02020   | TNGX334S0820        | 9,53 | 3/8 | 16,50 | .650 | 1,6 | 1/16 | ●     | -      |

## Kendex Positive Inserts

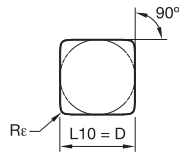


- first choice
- alternate choice

|   |   |   |  |
|---|---|---|--|
| P |   |   |  |
| M |   |   |  |
| K | ● | ● |  |
| N |   |   |  |
| S |   | ○ |  |
| H | ○ | ● |  |

## RCGN

| ISO catalog number | ANSI catalog number | D    |     | L10 |    | Rε |    | KBK45 | KB1340 |
|--------------------|---------------------|------|-----|-----|----|----|----|-------|--------|
|                    |                     | mm   | in  | mm  | in | mm | in |       |        |
| RCGN090400T01015   | RCGN33T0415         | 9,53 | 3/8 | -   | -  | -  | -  | ●     | -      |



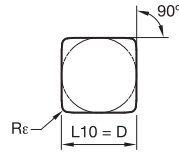
- first choice
- alternate choice

|   |   |   |   |
|---|---|---|---|
| P |   |   |   |
| M |   |   |   |
| K | ● | ● |   |
| N |   |   |   |
| S |   | ○ |   |
| H |   | ○ | ● |

ISO/ANSI Turning

### SCGN-WCB

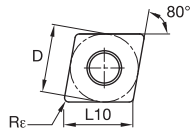
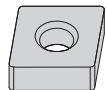
| ISO catalog number  | ANSI catalog number | D    |     | L10  |      | Rε  |      | KBK45 | KB1340 |
|---------------------|---------------------|------|-----|------|------|-----|------|-------|--------|
|                     |                     | mm   | in  | mm   | in   | mm  | in   |       |        |
| SCGN090408S01015WCB | SCGN332S0415WCB     | 9,53 | 3/8 | 9,52 | .375 | 0,8 | 1/32 | ●     | -      |



### SCGN-WCC

| ISO catalog number  | ANSI catalog number | D    |     | L10  |      | Rε  |      | KBK45 | KB1340 |
|---------------------|---------------------|------|-----|------|------|-----|------|-------|--------|
|                     |                     | mm   | in  | mm   | in   | mm  | in   |       |        |
| SCGN090408S01015WCC | SCGN332S0415WCC     | 9,53 | 3/8 | 9,52 | .375 | 0,8 | 1/32 | ●     | -      |

## Kenloc™ Inserts



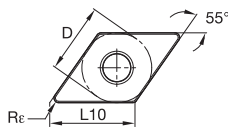
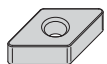
- first choice
- alternate choice

|   |   |   |   |
|---|---|---|---|
| P |   |   |   |
| M |   |   |   |
| K | ● | ● |   |
| N |   |   |   |
| S |   | ○ |   |
| H |   | ○ | ● |

### CNMA

| ISO catalog number | ANSI catalog number | D     |     | L10   |      | Rε  |      | KBK45 | KB1340 |
|--------------------|---------------------|-------|-----|-------|------|-----|------|-------|--------|
|                    |                     | mm    | in  | mm    | in   | mm  | in   |       |        |
| CNMA120408S02020   | CNMA432S0820        | 12,70 | 1/2 | 12,90 | .508 | 0,8 | 1/32 | -     | ●      |
| CNMA120412S02020   | CNMA433S0820        | 12,70 | 1/2 | 12,90 | .508 | 1,2 | 3/64 | -     | ●      |

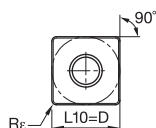
NOTE: For toolholders and boring bars, see pages B58–B76.



### DNMA

| ISO catalog number | ANSI catalog number | D    |     | L10   |      | Rε  |      | KBK45 | KB1340 |
|--------------------|---------------------|------|-----|-------|------|-----|------|-------|--------|
|                    |                     | mm   | in  | mm    | in   | mm  | in   |       |        |
| DNMA110408S02020   | DNMA332S0820        | 9,53 | 3/8 | 11,63 | .458 | 0,8 | 1/32 | -     | ●      |
| DNMA110412S02020   | DNMA333S0820        | 9,53 | 3/8 | 11,63 | .458 | 1,2 | 3/64 | -     | ●      |

NOTE: For toolholders and boring bars, see pages B87–B96.



- first choice  
○ alternate choice

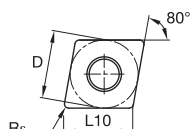
|   |   |   |   |
|---|---|---|---|
| P |   |   |   |
| M |   |   |   |
| K | ● | ● |   |
| N |   |   |   |
| S |   | ○ |   |
| H |   | ○ | ● |

## ■ SNMA

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KBK45 | KB1340 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |       |        |
| SNMA120412S02020      | SNMA433S0820           | 12,70 | 1/2 | 12,70 | .500 | 1,2 | 3/64 | -     | ●      |

NOTE: For toolholders and boring bars, see pages B109–B120.

## Advanced Material Inserts • Hard Turning Materials



- first choice  
○ alternate choice

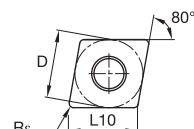
|   |   |   |  |
|---|---|---|--|
| P |   |   |  |
| M |   |   |  |
| K | ● | ● |  |
| N |   |   |  |
| S |   | ○ |  |
| H | ● | ● |  |

## ■ CNGA-FWMT

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KB1345 | KB5630 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|--------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |        |        |
| CNGA120404S01025FWMT  | CNGA431S0425FWMT       | 12,70 | 1/2 | 12,90 | .508 | 0,4 | 1/64 | -      | ●      |
| CNGA120408S01025FWMT  | CNGA432S0425FWMT       | 12,70 | 1/2 | 12,90 | .508 | 0,8 | 1/32 | -      | ●      |

NOTE: For toolholders and boring bars, see pages B87–B96.

## Tipped PcBN Inserts • Kenloc™ Inserts



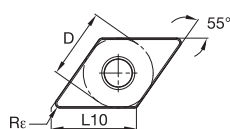
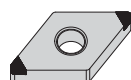
- first choice  
○ alternate choice

|   |   |   |  |
|---|---|---|--|
| P |   |   |  |
| M |   |   |  |
| K | ● | ● |  |
| N |   |   |  |
| S |   | ○ |  |
| H | ● | ● |  |

## ■ CNGA-MT

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KB1345 | KB5630 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|--------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |        |        |
| CNGA120404S01025MT    | CNGA431S0425MT         | 12,70 | 1/2 | 12,90 | .508 | 0,4 | 1/64 | -      | ●      |
| CNGA120408S01020MT    | CNGA432S0420MT         | 12,70 | 1/2 | 12,90 | .508 | 0,8 | 1/32 | ●      | -      |
| CNGA120408S01025MT    | CNGA432S0425MT         | 12,70 | 1/2 | 12,90 | .508 | 0,8 | 1/32 | -      | ●      |
| CNGA120408S02020MT    | CNGA432S0820MT         | 12,70 | 1/2 | 12,90 | .508 | 0,8 | 1/32 | ●      | -      |
| CNGA120412S01020MT    | CNGA433S0420MT         | 12,70 | 1/2 | 12,90 | .508 | 1,2 | 3/64 | -      | ●      |
| CNGA120412S01025MT    | CNGA433S0425MT         | 12,70 | 1/2 | 12,90 | .508 | 1,2 | 3/64 | -      | ●      |

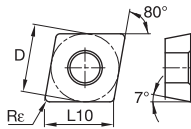
NOTE: For toolholders and boring bars, see pages B87–B96.



## ■ DNGA-MT

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KB1345 | KB5630 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|--------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |        |        |
| DNGA150404S01025MT    | DNGA431S0425MT         | 12,70 | 1/2 | 15,50 | .610 | 0,4 | 1/64 | -      | ●      |
| DNGA150408S01020MT    | DNGA432S0420MT         | 12,70 | 1/2 | 15,50 | .610 | 0,8 | 1/32 | ●      | -      |
| DNGA150408S01025MT    | DNGA432S0425MT         | 12,70 | 1/2 | 15,50 | .610 | 0,8 | 1/32 | -      | ●      |

NOTE: For toolholders and boring bars, see pages B87–B96.



- first choice
- alternate choice

|   |   |   |   |
|---|---|---|---|
| P |   |   |   |
| M |   |   |   |
| K | ● | ● | ● |
| N |   |   |   |
| S | ○ | ● | ● |
| H | ● | ● | ● |

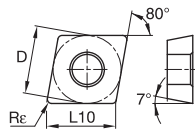
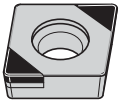
ISO/ANSI Turning

### ■ CCGW-C

| ISO<br>catalog number | ANSI<br>catalog number | D    |     | L10  |      | Re  |      | KB1345 | KB5630 |
|-----------------------|------------------------|------|-----|------|------|-----|------|--------|--------|
|                       |                        | mm   | in  | mm   | in   | mm  | in   |        |        |
| CCGW060202S01015C     | CCGW21505S0415C        | 6,35 | 1/4 | 6,45 | .254 | 0,2 | .008 | -      | ●      |
| CCGW060204S01015C     | CCGW2151S0415C         | 6,35 | 1/4 | 6,45 | .254 | 0,4 | 1/64 | -      | ●      |
| CCGW09T308EC          | CCGW3252EC             | 9,53 | 3/8 | 9,67 | .381 | 0,8 | 1/32 | ●      | -      |

NOTE: For toolholders and boring bars, see pages B193–B198.

## Kenloc™ Inserts



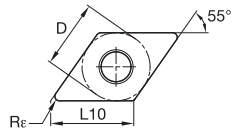
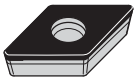
- first choice
- alternate choice

|   |   |   |   |
|---|---|---|---|
| P |   |   |   |
| M |   |   |   |
| K | ● | ● | ● |
| N |   |   |   |
| S | ○ | ● | ● |
| H | ● | ● | ● |

### ■ CCGW-MT

| ISO<br>catalog number | ANSI<br>catalog number | D    |     | L10  |      | Re  |      | KB1345 | KB5630 |
|-----------------------|------------------------|------|-----|------|------|-----|------|--------|--------|
|                       |                        | mm   | in  | mm   | in   | mm  | in   |        |        |
| CCGW09T304S01015MT    | CCGW3251S0415MT        | 9,53 | 3/8 | 9,67 | .381 | 0,4 | 1/64 | -      | ●      |
| CCGW09T308S01015MT    | CCGW3252S0415MT        | 9,53 | 3/8 | 9,67 | .381 | 0,8 | 1/32 | -      | ●      |

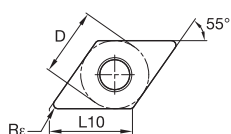
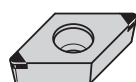
NOTE: For toolholders and boring bars, see pages B193–B198.



### ■ DCGW-C

| ISO<br>catalog number | ANSI<br>catalog number | D    |     | L10  |      | Re  |      | KB1345 | KB5630 |
|-----------------------|------------------------|------|-----|------|------|-----|------|--------|--------|
|                       |                        | mm   | in  | mm   | in   | mm  | in   |        |        |
| DCGW070202S01015C     | DCGW21505S0415C        | 6,35 | 1/4 | 7,75 | .305 | 0,2 | .008 | -      | ●      |
| DCGW070204S01015C     | DCGW2151S0415C         | 6,35 | 1/4 | 7,75 | .305 | 0,4 | 1/64 | -      | ●      |

NOTE: For toolholders and boring bars, see pages B227–B230.



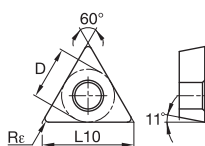
- first choice
- alternate choice

|   |   |   |  |
|---|---|---|--|
| P |   |   |  |
| M |   |   |  |
| K | ● | ● |  |
| N |   |   |  |
| S | ○ | ● |  |
| H | ● | ● |  |

■ DCGW-MT

| ISO<br>catalog number | ANSI<br>catalog number | D    |     | L10   |      | Rε  |      | KB1345 | KB5630 |
|-----------------------|------------------------|------|-----|-------|------|-----|------|--------|--------|
|                       |                        | mm   | in  | mm    | in   | mm  | in   |        |        |
| DCGW11T304S01015MT    | DCGW3251S0415MT        | 9,53 | 3/8 | 11,63 | .458 | 0,4 | 1/64 | ●      | ●      |
| DCGW11T308S01015MT    | DCGW3252S0415MT        | 9,53 | 3/8 | 11,63 | .458 | 0,8 | 1/32 | ●      | ●      |

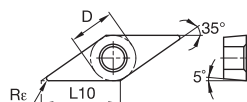
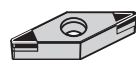
NOTE: For toolholders and boring bars, see pages B227–B230.



■ TPGW-C

| ISO<br>catalog number | ANSI<br>catalog number | D    |     | L10   |      | Rε  |      | KB1345 | KB5630 |
|-----------------------|------------------------|------|-----|-------|------|-----|------|--------|--------|
|                       |                        | mm   | in  | mm    | in   | mm  | in   |        |        |
| TPGW110204EC          | TPGW2151EC             | 6,35 | 1/4 | 11,00 | .433 | 0,4 | 1/64 | ●      | –      |
| TPGW110208S01015C     | TPGW2152S0415C         | 6,35 | 1/4 | 11,00 | .433 | 0,8 | 1/32 | –      | ●      |

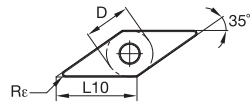
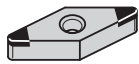
NOTE: For toolholders and boring bars, see pages B270–B279.



■ VBGW-MT

| ISO<br>catalog number | ANSI<br>catalog number | D    |     | L10   |      | Rε  |      | KB1345 | KB5630 |
|-----------------------|------------------------|------|-----|-------|------|-----|------|--------|--------|
|                       |                        | mm   | in  | mm    | in   | mm  | in   |        |        |
| VBGW160404S01015MT    | VBGW331S0415MT         | 9,53 | 3/8 | 16,61 | .654 | 0,4 | 1/64 | –      | ●      |
| VBGW160408S01015MT    | VBGW332S0415MT         | 9,53 | 3/8 | 16,61 | .654 | 0,8 | 1/32 | –      | ●      |

NOTE: For toolholders and boring bars, see pages B282–B285.



### VNGA-MT

- first choice
- alternate choice

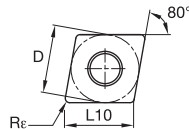
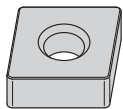
|   |   |   |   |
|---|---|---|---|
| P |   |   |   |
| M |   |   |   |
| K | ● | ● | ● |
| N |   |   |   |
| S | ○ | ● | ● |
| H | ● | ● | ● |

ISO/ANSI Turning

| ISO catalog number | ANSI catalog number | D    |     | L10   |      | Re  |      | KB1345 | KB5630 |
|--------------------|---------------------|------|-----|-------|------|-----|------|--------|--------|
|                    |                     | mm   | in  | mm    | in   | mm  | in   |        |        |
| VNGA160404S01025MT | VNGA331S0425MT      | 9,53 | 3/8 | 16,61 | .654 | 0,4 | 1/64 | —      | ●      |
| VNGA160408S01025MT | VNGA332S0425MT      | 9,53 | 3/8 | 16,61 | .654 | 0,8 | 1/32 | —      | ●      |

NOTE: For toolholders and boring bars, see pages B282–B285.

## ISO/ANSI Ceramic Inserts



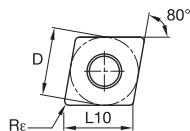
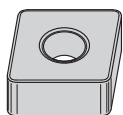
### CNGA

- first choice
- alternate choice

|   |   |   |   |
|---|---|---|---|
| P |   |   |   |
| M |   |   |   |
| K | ● | ● | ● |
| N |   |   |   |
| S |   |   |   |
| H |   |   |   |

| ISO catalog number | ANSI catalog number | D     |     | L10   |      | Re  |      | KYK25 | KYK10 | KY3500 |
|--------------------|---------------------|-------|-----|-------|------|-----|------|-------|-------|--------|
|                    |                     | mm    | in  | mm    | in   | mm  | in   |       |       |        |
| CNGA120408T02020   | CNGA432T0820        | 12,70 | 1/2 | 12,90 | .508 | 0,8 | 1/32 | ●     | ●     | ●      |
| CNGA120412T02020   | CNGA433T0820        | 12,70 | 1/2 | 12,90 | .508 | 1,2 | 3/64 | ●     | ●     | ●      |
| CNGA120416T02020   | CNGA434T0820        | 12,70 | 1/2 | 12,90 | .508 | 1,6 | 1/16 | ●     | ●     | ●      |
| CNGA160612T02020   | CNGA543T0820        | 15,88 | 5/8 | 16,12 | .635 | 1,2 | 3/64 | ●     | —     | ●      |
| CNGA160616T02020   | CNGA544T0820        | 15,88 | 5/8 | 16,12 | .635 | 1,6 | 1/16 | —     | —     | ●      |
| CNGA190612T02020   | CNGA643T0820        | 19,05 | 3/4 | 19,34 | .762 | 1,2 | 3/64 | —     | —     | ●      |
| CNGA190616T02020   | CNGA644T0820        | 19,05 | 3/4 | 19,34 | .762 | 1,6 | 1/16 | ●     | —     | ●      |

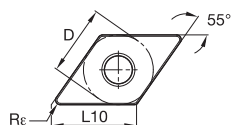
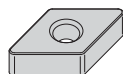
NOTE: For toolholders and boring bars, see pages B58–B76.



### CNGA-FW

| ISO catalog number | ANSI catalog number | D     |     | L10   |      | Re  |      | KYK25 | KYK10 | KY3500 |
|--------------------|---------------------|-------|-----|-------|------|-----|------|-------|-------|--------|
|                    |                     | mm    | in  | mm    | in   | mm  | in   |       |       |        |
| CNGA120408T01020FW | CNGA432T0420FW      | 12,70 | 1/2 | 12,90 | .508 | 0,8 | 1/32 | ●     | —     | ●      |
| CNGA120412T01020FW | CNGA433T0420FW      | 12,70 | 1/2 | 12,90 | .508 | 1,2 | 3/64 | ●     | ●     | ●      |
| CNGA120412T02020FW | CNGA433T0820FW      | 12,70 | 1/2 | 12,90 | .508 | 1,2 | 3/64 | —     | ●     | —      |
| CNGA120416T01020FW | CNGA434T0420FW      | 12,70 | 1/2 | 12,90 | .508 | 1,6 | 1/16 | —     | —     | ●      |

NOTE: For toolholders and boring bars, see pages B58–B76.



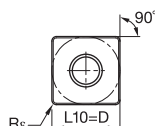
- first choice
- alternate choice

|   |   |   |   |   |
|---|---|---|---|---|
| P |   |   |   |   |
| M |   |   |   |   |
| K | ● | ● | ● | ● |
| N |   |   |   |   |
| S |   |   |   |   |
| H |   |   |   |   |

## DNGA

| ISO catalog number | ANSI catalog number | D     |     | L10   |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|--------------------|---------------------|-------|-----|-------|------|-----|------|-------|-------|--------|
|                    |                     | mm    | in  | mm    | in   | mm  | in   |       |       |        |
| DNGA150408T02020   | DNGA432T0820        | 12,70 | 1/2 | 15,50 | .610 | 0,8 | 1/32 | -     | -     | ●      |
| DNGA150412T02020   | DNGA433T0820        | 12,70 | 1/2 | 15,50 | .610 | 1,2 | 3/64 | -     | -     | ●      |
| DNGA150416T02020   | DNGA434T0820        | 12,70 | 1/2 | 15,50 | .610 | 1,6 | 1/16 | ●     | -     | ●      |
| DNGA150608T02020   | DNGA442T0820        | 12,70 | 1/2 | 15,50 | .610 | 0,8 | 1/32 | -     | -     | ●      |
| DNGA150612T02020   | DNGA443T0820        | 12,70 | 1/2 | 15,50 | .610 | 1,2 | 3/64 | -     | -     | ●      |

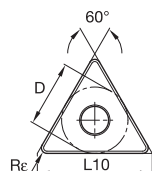
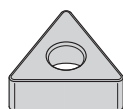
NOTE: For toolholders and boring bars, see pages B87–B96.



## SNGA

| ISO catalog number | ANSI catalog number | D     |     | L10   |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|--------------------|---------------------|-------|-----|-------|------|-----|------|-------|-------|--------|
|                    |                     | mm    | in  | mm    | in   | mm  | in   |       |       |        |
| SNGA120408T02020   | SNGA432T0820        | 12,70 | 1/2 | 12,70 | .500 | 0,8 | 1/32 | ●     | ●     | ●      |
| SNGA120412T02020   | SNGA433T0820        | 12,70 | 1/2 | 12,70 | .500 | 1,2 | 3/64 | ●     | -     | ●      |
| SNGA120416T02020   | SNGA434T0820        | 12,70 | 1/2 | 12,70 | .500 | 1,6 | 1/16 | -     | -     | ●      |
| SNGA150612T02020   | SNGA543T0820        | 15,88 | 5/8 | 15,88 | .625 | 1,2 | 3/64 | ●     | -     | -      |
| SNGA150612T02020   | SNGA543T            | 15,88 | 5/8 | 15,88 | .625 | 1,2 | 3/64 | -     | -     | ●      |
| SNGA150616T02020   | SNGA544T            | 15,88 | 5/8 | 15,88 | .625 | 1,6 | 1/16 | -     | -     | ●      |
| SNGA190612T02020   | SNGA643T0820        | 19,05 | 3/4 | 19,05 | .750 | 1,2 | 3/64 | -     | -     | ●      |

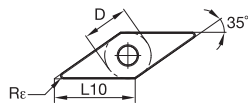
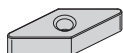
NOTE: For toolholders and boring bars, see pages B109–B120.



## TNGA

| ISO catalog number | ANSI catalog number | D    |     | L10   |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|--------------------|---------------------|------|-----|-------|------|-----|------|-------|-------|--------|
|                    |                     | mm   | in  | mm    | in   | mm  | in   |       |       |        |
| TNGA160408T02020   | TNGA332T0820        | 9,53 | 3/8 | 16,50 | .650 | 0,8 | 1/32 | -     | ●     | ●      |
| TNGA160412T02020   | TNGA333T0820        | 9,53 | 3/8 | 16,50 | .650 | 1,2 | 3/64 | -     | -     | ●      |
| TNGA160416T02020   | TNGA334T0820        | 9,53 | 3/8 | 16,50 | .650 | 1,6 | 1/16 | -     | -     | ●      |

NOTE: For toolholders and boring bars, see pages B131–B143.



- first choice
- alternate choice

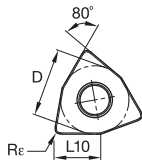
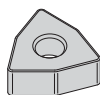
|   |   |   |   |
|---|---|---|---|
| P |   |   |   |
| M |   |   |   |
| K | ● | ● | ● |
| N |   |   |   |
| S |   |   |   |
| H |   |   |   |

ISO/ANSI Turning

## VNGA

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|-------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |       |       |        |
| VNGA160408T02020      | VNGA332T0820           | 9,53  | 3/8 | 16,61 | .654 | 0,8 | 1/32 | -     | -     | ●      |
| VNGA220408T02020      | VNGA432T0820           | 12,70 | 1/2 | 22,14 | .872 | 0,8 | 1/32 | ●     | -     | -      |

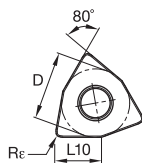
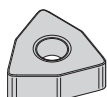
NOTE: For toolholders and boring bars, see pages B150–B155.



## WNGA

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10  |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|-------|-----|------|------|-----|------|-------|-------|--------|
|                       |                        | mm    | in  | mm   | in   | mm  | in   |       |       |        |
| WNGA080408T02020      | WNGA432T0820           | 12,70 | 1/2 | 8,69 | .342 | 0,8 | 1/32 | ●     | -     | ●      |
| WNGA080412T02020      | WNGA433T0820           | 12,70 | 1/2 | 8,69 | .342 | 1,2 | 3/64 | ●     | -     | ●      |
| WNGA080416T02020      | WNGA434T0820           | 12,70 | 1/2 | 8,69 | .342 | 1,6 | 1/16 | -     | -     | ●      |

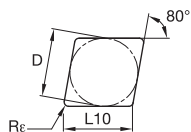
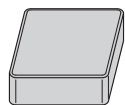
NOTE: For toolholders and boring bars, see page B163.



## WNGA-FW

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10  |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|-------|-----|------|------|-----|------|-------|-------|--------|
|                       |                        | mm    | in  | mm   | in   | mm  | in   |       |       |        |
| WNGA080408T01020FW    | WNGA432T0420FW         | 12,70 | 1/2 | 8,69 | .342 | 0,8 | 1/32 | -     | -     | ●      |

NOTE: For toolholders and boring bars, see page B163.

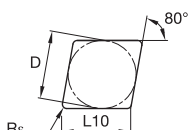
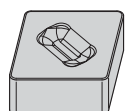


- first choice
- alternate choice

|   |   |   |   |  |
|---|---|---|---|--|
| P |   |   |   |  |
| M |   |   |   |  |
| K | ● | ● | ● |  |
| N |   |   |   |  |
| S |   |   |   |  |
| H |   |   |   |  |

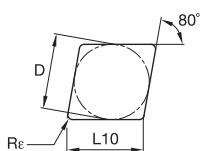
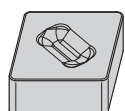
### ■ CNGN/CNG

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|-------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |       |       |        |
| CNGN120408T02020      | CNG432T0820            | 12,70 | 1/2 | 12,90 | .508 | 0,8 | 1/32 | -     | -     | ●      |
| CNGN120412T02020      | CNG433T0820            | 12,70 | 1/2 | 12,90 | .508 | 1,2 | 3/64 | -     | -     | ●      |
| CNGN120416T02020      | CNG434T0820            | 12,70 | 1/2 | 12,90 | .508 | 1,6 | 1/16 | -     | -     | ●      |
| CNGN120712T02020      | CNG453T0820            | 12,70 | 1/2 | 12,90 | .508 | 1,2 | 3/64 | -     | -     | ●      |
| CNGN120716T02020      | CNG454T0820            | 12,70 | 1/2 | 12,90 | .508 | 1,6 | 1/16 | -     | ●     | -      |



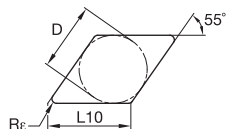
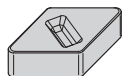
### ■ CNGX-FW

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|-------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |       |       |        |
| CNGX120708T01020FW    | CNGX452T0420FW         | 12,70 | 1/2 | 12,90 | .508 | 0,8 | 1/32 | -     | -     | ●      |
| CNGX120712T01020FW    | CNGX453T0420FW         | 12,70 | 1/2 | 12,90 | .508 | 1,2 | 3/64 | -     | -     | ●      |
| CNGX120716T01020FW    | CNGX454T0420FW         | 12,70 | 1/2 | 12,90 | .508 | 1,6 | 1/16 | -     | -     | ●      |



### ■ CNMX

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|-------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |       |       |        |
| CNMX120708T02020      | CNMX452T0820           | 12,70 | 1/2 | 12,90 | .508 | 0,8 | 1/32 | -     | -     | ●      |
| CNMX120712T02020      | CNMX453T0820           | 12,70 | 1/2 | 12,90 | .508 | 1,2 | 3/64 | -     | -     | ●      |
| CNMX120716T02020      | CNMX454T0820           | 12,70 | 1/2 | 12,90 | .508 | 1,6 | 1/16 | -     | -     | ●      |

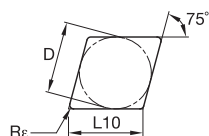


■ DNGX

- first choice
- alternate choice

|   |   |   |   |   |
|---|---|---|---|---|
| P |   |   |   |   |
| M |   |   |   |   |
| K | ● | ● | ● | ● |
| N |   |   |   |   |
| S |   |   |   |   |
| H |   |   |   |   |

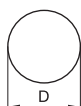
| ISO<br>catalog number | ANSI<br>catalog number | D     |       | L10   |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|-------|-------|-------|------|-----|------|-------|-------|--------|
|                       |                        | mm    | in    | mm    | in   | mm  | in   |       |       |        |
| DNGX120708T02020      | DNGX120708T02020       | 10,00 | .3937 | 12,21 | .481 | 0,8 | 1/32 | -     | -     | ●      |
| DNGX120712T02020      | DNGX120712T02020       | 10,00 | .3937 | 12,21 | .481 | 1,2 | 3/64 | ●     | -     | ●      |
| DNGX120716T02020      | DNGX120716T02020       | 10,00 | .3937 | 12,21 | .481 | 1,6 | 1/16 | -     | -     | ●      |
| DNGX150708T02020      | DNGX452T0820           | 12,70 | 1/2   | 15,50 | .610 | 0,8 | 1/32 | -     | -     | ●      |
| DNGX150712T02020      | DNGX453T0820           | 12,70 | 1/2   | 15,50 | .610 | 1,2 | 3/64 | ●     | -     | ●      |
| DNGX150716T02020      | DNGX454T0820           | 12,70 | 1/2   | 15,50 | .610 | 1,6 | 1/16 | -     | -     | ●      |



■ ENGX

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|-------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |       |       |        |
| ENGX130716T02020      | ENGX454T0820           | 12,70 | 1/2 | 13,15 | .518 | 1,6 | 1/16 | -     | -     | ●      |

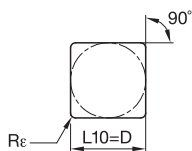
ISO/ANSI Turning



- first choice
- alternate choice

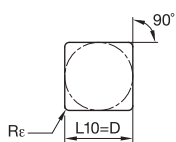
### RNGN/RNG

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10 |    | R <sub>ε</sub> |    | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|-------|-----|-----|----|----------------|----|-------|-------|--------|
|                       |                        | mm    | in  | mm  | in | mm             | in |       |       |        |
| RNGN120400T02020      | RNG43T0820             | 12,70 | 1/2 | —   | —  | —              | —  | —     | ●     | ●      |
| RNGN120700T02020      | RNG45T0820             | 12,70 | 1/2 | —   | —  | —              | —  | —     | —     | ●      |
| RNGN190700T02020      | RNG65T0820             | 19,05 | 3/4 | —   | —  | —              | —  | —     | —     | ●      |



### SNGN/SNG

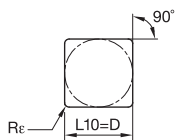
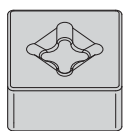
| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | R <sub>ε</sub> |      | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|-------|-----|-------|------|----------------|------|-------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm             | in   |       |       |        |
| SNGN090308T02020      | SNG322T0820            | 9,53  | 3/8 | 9,53  | .375 | 0,8            | 1/32 | —     | —     | ●      |
| SNGN120408T02020      | SNG432T0820            | 12,70 | 1/2 | 12,70 | .500 | 0,8            | 1/32 | ●     | —     | ●      |
| SNGN120412T02020      | SNG433T0820            | 12,70 | 1/2 | 12,70 | .500 | 1,2            | 3/64 | ●     | —     | ●      |
| SNGN120416T02020      | SNG434T0820            | 12,70 | 1/2 | 12,70 | .500 | 1,6            | 1/16 | —     | —     | ●      |
| SNGN120432T02020      | SNG438T0820            | 12,70 | 1/2 | 12,70 | .500 | 3,2            | 1/8  | —     | —     | ●      |
| SNGN120712T02020      | SNG453T0820            | 12,70 | 1/2 | 12,70 | .500 | 1,2            | 3/64 | ●     | —     | —      |
| SNGN120716T02020      | SNG454T0820            | 12,70 | 1/2 | 12,70 | .500 | 1,6            | 1/16 | —     | —     | ●      |
| SNGN190416T02020      | SNG634T0820            | 19,05 | 3/4 | 19,05 | .750 | 1,6            | 1/16 | —     | —     | ●      |



### SNGX

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | R <sub>ε</sub> |      | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|-------|-----|-------|------|----------------|------|-------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm             | in   |       |       |        |
| SNGX120712T02020      | SNGX453T0820           | 12,70 | 1/2 | 12,70 | .500 | 1,2            | 3/64 | ●     | ●     | ●      |
| SNGX120716T02020      | SNGX454T0820           | 12,70 | 1/2 | 12,70 | .500 | 1,6            | 1/16 | ●     | ●     | ●      |
| SNGX150716T02020      | SNGX554T0820           | 15,88 | 5/8 | 15,88 | .625 | 1,6            | 1/16 | —     | —     | ●      |
| SNGX150724T02020      | SNGX556T0820           | 15,88 | 5/8 | 15,88 | .625 | 2,4            | 3/32 | —     | —     | ●      |

|   |   |   |   |   |
|---|---|---|---|---|
| P |   |   |   |   |
| M |   |   |   |   |
| K | ● | ● | ● | ● |
| N |   |   |   |   |
| S |   |   |   |   |
| H |   |   |   |   |

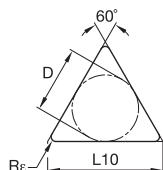
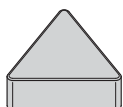


- first choice
- alternate choice

|   |   |   |   |  |
|---|---|---|---|--|
| P |   |   |   |  |
| M |   |   |   |  |
| K | ● | ● | ● |  |
| N |   |   |   |  |
| S |   |   |   |  |
| H |   |   |   |  |

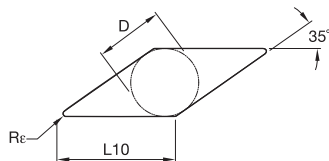
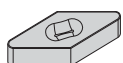
### ■ SNMX

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|-------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |       |       |        |
| SNMX120712T02020      | SNMX453T0820           | 12,70 | 1/2 | 12,70 | .500 | 1,2 | 3/64 | -     | -     | ●      |
| SNMX120716T02020      | SNMX454T0820           | 12,70 | 1/2 | 12,70 | .500 | 1,6 | 1/16 | -     | -     | ●      |
| SNMX150716T02020      | SNMX554T0820           | 15,88 | 5/8 | 15,88 | .625 | 1,6 | 1/16 | -     | -     | ●      |



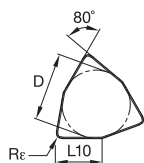
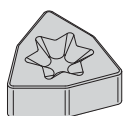
### ■ TNGN/TNG

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|-------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |       |       |        |
| TNGN160408T02020      | TNG332T0820            | 9,53  | 3/8 | 16,50 | .650 | 0,8 | 1/32 | -     | -     | ●      |
| TNGN220416T02020      | TNG434T0820            | 12,70 | 1/2 | 22,00 | .866 | 1,6 | 1/16 | -     | -     | ●      |



### ■ VNGX

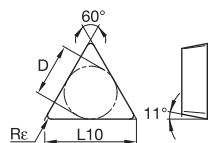
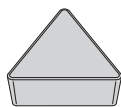
| ISO<br>catalog number | ANSI<br>catalog number | D    |     | L10   |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|------|-----|-------|------|-----|------|-------|-------|--------|
|                       |                        | mm   | in  | mm    | in   | mm  | in   |       |       |        |
| VNGX160712T02020      | VNGX353T0820           | 9,52 | 3/8 | 16,61 | .654 | 1,2 | 3/64 | -     | -     | ●      |
| VNGX160716T02020      | VNGX354T0820           | 9,53 | 3/8 | 16,61 | .654 | 1,6 | 1/16 | -     | -     | ●      |



### ■ WNGX

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10  |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|-------|-----|------|------|-----|------|-------|-------|--------|
|                       |                        | mm    | in  | mm   | in   | mm  | in   |       |       |        |
| WNGX080712T02020      | WNGX453T0820           | 12,70 | 1/2 | 8,69 | .342 | 1,2 | 3/64 | -     | ●     | ●      |

ISO/ANSI Turning

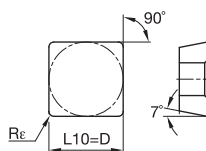
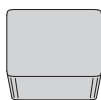


- first choice  
○ alternate choice

|   |   |   |   |  |
|---|---|---|---|--|
| P |   |   |   |  |
| M |   |   |   |  |
| K | ● | ● | ● |  |
| N |   |   |   |  |
| S |   |   |   |  |
| H |   |   |   |  |

## ■ TPGN/TPG

| ISO<br>catalog number | ANSI<br>catalog number | D     |     | L10   |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|-------|-----|-------|------|-----|------|-------|-------|--------|
|                       |                        | mm    | in  | mm    | in   | mm  | in   |       |       |        |
| TPGN160308T02020      | TPG322T0820            | 9,53  | 3/8 | 16,50 | .650 | 0,8 | 1/32 | -     | -     | ●      |
| TPGN160312T02020      | TPG323T0820            | 9,53  | 3/8 | 16,50 | .650 | 1,2 | 3/64 | -     | ●     | ●      |
| TPGN220408T02020      | TPG432T0820            | 12,70 | 1/2 | 22,00 | .866 | 0,8 | 1/32 | -     | -     | ●      |
| TPGN220412T02020      | TPG433T0820            | 12,70 | 1/2 | 22,00 | .866 | 1,2 | 3/64 | -     | -     | ●      |



## ■ SCGN-FW/SCG-FW

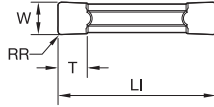
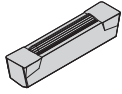
| ISO<br>catalog number | ANSI<br>catalog number | D    |     | L10  |      | Rε  |      | KYK25 | KYK10 | KY3500 |
|-----------------------|------------------------|------|-----|------|------|-----|------|-------|-------|--------|
|                       |                        | mm   | in  | mm   | in   | mm  | in   |       |       |        |
| SCGN090408EFW         | SCG332FW               | 9,53 | 3/8 | 9,53 | .375 | 0,8 | 1/32 | -     | -     | ●      |

## ■ Clamp Selection Chart

| order number | catalog number     | clamp               |                    |
|--------------|--------------------|---------------------|--------------------|
| 3960807      | CNGX120412S01015   | 551.718-100° Corner | 551.716-80° Corner |
| 3960808      | CNGX120412S01015FW | 551.718-100° Corner | 551.716-80° Corner |
| 3960806      | CNGX120416S02020   | 551.718-100° Corner | 551.716-80° Corner |
| 3960811      | DNGX150416S02020   | 551.720             | 551.720            |
| 3960812      | SNGX120416S02020   | 551.718             | 551.718            |
| 3960823      | SNGX150416S02020   | 551.718             | 551.718            |
| 3876843      | CNGF120408         | 551.718-100° Corner | 551.716-80° Corner |
| 3960825      | TNGX160412EFW      | 551.733             | 551.733            |

|   |   |
|---|---|
| P |   |
| M |   |
| K | ● |
| N |   |
| S |   |
| H |   |

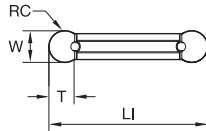
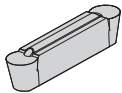
ISO/ANSI Turning



### ■ A4G-P-T

| ISO catalog number  | ANSI catalog number | seat size | W    |      | RR  |      | LI |      | T   |      | KY3500 |
|---------------------|---------------------|-----------|------|------|-----|------|----|------|-----|------|--------|
|                     |                     |           | mm   | in   | mm  | in   | mm | in   | mm  | in   |        |
| A4G0300M03P04T01025 | A4G0300M03P04T01025 | 3         | 3,00 | .118 | 0,4 | .016 | 20 | .79  | 3,4 | .134 | ●      |
| A4G125I03P1T0425    | A4G125I03P1T0425    | 3         | 3,18 | .125 | 0,4 | .016 | 20 | .79  | 3,4 | .134 | ●      |
| A4G0400M04P04T01025 | A4G0400M04P04T01025 | 4         | 4,00 | .157 | 0,4 | .016 | 20 | .79  | 3,4 | .134 | ●      |
| A4G0500M05P08T01025 | A4G0500M05P08T01025 | 5         | 5,00 | .197 | 0,8 | .031 | 25 | .98  | 4,2 | .165 | ●      |
| A4G0600M06P08T01025 | A4G0600M06P08T01025 | 6         | 6,00 | .236 | 0,8 | .031 | 30 | 1.18 | 4,8 | .189 | ●      |
| A4G250I06P2T0425    | A4G250I06P2T0425    | 6         | 6,35 | .250 | 0,8 | .031 | 30 | 1.18 | 4,9 | .193 | ●      |
| A4G0800M08P08T01025 | A4G0800M08P08T01025 | 8         | 8,00 | .315 | 0,8 | .031 | 30 | 1.18 | 6,4 | .250 | ●      |

NOTE: For A4 holder, boring bars, and blades, see pages C114–C151.



### ■ A4R-P-T

| ISO catalog number  | ANSI catalog number | seat size | W    |      | RC  |      | LI |      | T   |      | KY3500 |
|---------------------|---------------------|-----------|------|------|-----|------|----|------|-----|------|--------|
|                     |                     |           | mm   | in   | mm  | in   | mm | in   | mm  | in   |        |
| A4R0300M03P00T01025 | A4R0300M03P00T01025 | 3         | 3,00 | .118 | 1,5 | .059 | 20 | .79  | 2,4 | .095 | ●      |
| A4R0500M05P00T01025 | A4R0500M05P00T01025 | 5         | 5,00 | .197 | 2,5 | .098 | 25 | .98  | 4,1 | .163 | ●      |
| A4R0600M06P00T01025 | A4R0600M06P00T01025 | 6         | 6,00 | .236 | 3,0 | .118 | 30 | 1.18 | 4,3 | .167 | ●      |
| A4R250I06P00T0425   | A4R250I06P00T0425   | 6         | 6,35 | .250 | 3,2 | .125 | 30 | 1.18 | 4,8 | .191 | ●      |
| A4R0800M08P00T01025 | A4R0800M08P00T01025 | 8         | 8,00 | .315 | 4,0 | .157 | 30 | 1.18 | 6,4 | .250 | ●      |

NOTE: For toolholders and boring bars, see page B163.