



# **2017** Master Catalog

**WIDIA**  <sup>TM</sup>

High-Performance Solid Carbide End Mills •

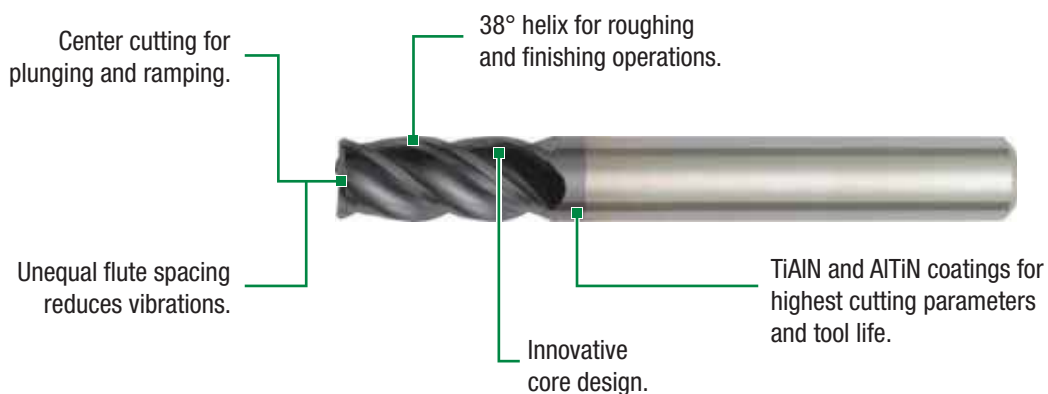
**VariMill I™**

# VariMill I



VariMill I offers plunging, slotting, and profiling at the highest possible feed rates for a wide range of materials. They are designed to provide maximum Metal Removal Rates (MRR) and to achieve superior surface conditions. A wide range of diameters and corner configurations, such as chamfer, radii, and sharp edges, are available from stock.

- High-performance universal tools for almost all workpiece materials.
- Roughing and finishing with one tool.
- Various length-of-cut, long reach and necked versions, ball nose, corner chamfer, and corner radius available.



## VariMill I™ Series

- Four unequally spaced flutes.
- Increase your output with less tool changes and increased Metal Removal Rates (MRR).
- No specific tools for roughing and finishing required.
- Less passes due to 1 x D slotting capability.

### 4V05 Series

- High metal removal rates and tool life in:
  - Stainless steels, steels, and alloyed steels.
  - High-temperature alloys and titanium.
- Radii, sharp, and corner chamfer configuration.



### 4V0T

- Titanium geometry design.
- Sharp and corner chamfer configuration.



### 4VP5 Series

- Stainless steel and steel geometry design.
- Sharp and corner chamfer configuration.
- Benefit from long reach design for deep cavities.



### 4VPT Series

- Titanium geometry design.
- Sharp and corner chamfer configuration.
- Benefit from long reach design for deep cavities.



### 4VN5 Series

- Stainless steel and steel geometry design.
- Sharp and corner chamfer configuration.
- Benefit from long reach and neck design for deep cavities.



### 4VP0 Series

- Center cutting ball nose series.
- Benefit from long reach design for deep cavities.

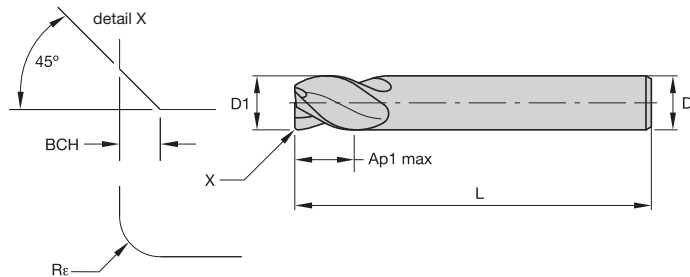
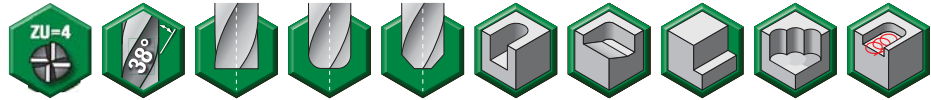


### 4V00 Series

- Center cutting ball nose series.
- Benefit from long length of cut.



- Unequal flute spacing.
- Center cutting.
- Single tool for both roughing and finishing operations requiring fewer setups.
- Standard items listed. Additional styles and coatings made to order.

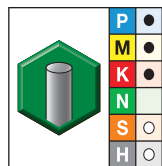


End Mill Tolerances

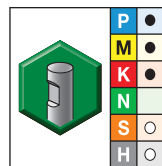
| D1  | tolerance    | D               | tolerance h6 + / - |
|-----|--------------|-----------------|--------------------|
| All | +0.00/-0.002 | ≤ 1/8"          | 0/0.00024          |
|     |              | > 1/8-1/4"      | 0/0.00031          |
|     |              | > 1/4-3/8"      | 0/0.00035          |
|     |              | > 3/8-23/32"    | 0/0.00043          |
|     |              | > 23/32-1 3/16" | 0/0.00051          |

**WIDIA**  
**VICTORY**

### Series 4V05 4V15 4V45 4V65 • VariMill I • Victory Grades



grade WP15PE  
AlTiN



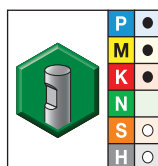
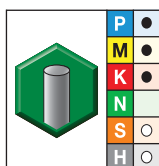
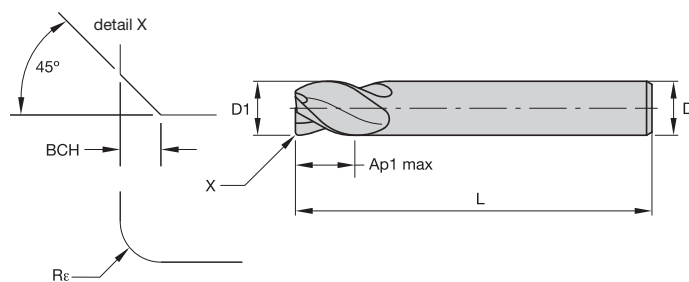
grade WP15PE  
AlTiN

- first choice
- alternate choice

| order # | catalog #   | order # | catalog # | D1   | D    | length of cut<br>Ap1 max | length<br>L | Rε   | BCH  |
|---------|-------------|---------|-----------|------|------|--------------------------|-------------|------|------|
| 5576590 | 4V4503001NT | -       | -         | 1/8  | 1/8  | 1/4                      | 1 1/2       | -    | .010 |
| 5576591 | 4V4503001ST | -       | -         | 1/8  | 1/8  | 1/4                      | 1 1/2       | -    | -    |
| 5576530 | 4V0503001AT | -       | -         | 1/8  | 1/8  | 1/2                      | 2           | .015 | -    |
| 5576346 | 4V0503001ST | -       | -         | 1/8  | 1/8  | 1/2                      | 2           | -    | -    |
| 5576345 | 4V0503001NT | -       | -         | 1/8  | 1/8  | 1/2                      | 2           | -    | .010 |
| 5576592 | 4V4505000NT | -       | -         | 3/16 | 3/16 | 5/16                     | 1 1/2       | -    | .010 |
| 5576593 | 4V4505000ST | -       | -         | 3/16 | 3/16 | 5/16                     | 1 1/2       | -    | -    |
| 5576531 | 4V0505000AT | -       | -         | 3/16 | 3/16 | 5/8                      | 2 1/4       | .015 | -    |
| 5576532 | 4V0505000BT | -       | -         | 3/16 | 3/16 | 5/8                      | 2 1/4       | .030 | -    |
| 5576347 | 4V0505000NT | -       | -         | 3/16 | 3/16 | 5/8                      | 2 1/4       | -    | .010 |
| 5576348 | 4V0505000ST | -       | -         | 3/16 | 3/16 | 5/8                      | 2 1/4       | -    | -    |
| 5576610 | 4V4507002BT | -       | -         | 1/4  | 1/4  | 3/8                      | 2           | .030 | -    |
| 5576596 | 4V4507002ST | -       | -         | 1/4  | 1/4  | 3/8                      | 2           | -    | -    |
| 5576595 | 4V4507002NT | -       | -         | 1/4  | 1/4  | 3/8                      | 2 1/2       | -    | .016 |
| 5576533 | 4V0507002AT | -       | -         | 1/4  | 1/4  | 3/4                      | 2 1/2       | .015 | -    |
| 5576534 | 4V0507002BT | -       | -         | 1/4  | 1/4  | 3/4                      | 2 1/2       | .030 | -    |
| 5576535 | 4V0507002CT | -       | -         | 1/4  | 1/4  | 3/4                      | 2 1/2       | .060 | -    |
| 5576349 | 4V0507002NT | -       | -         | 1/4  | 1/4  | 3/4                      | 2 1/2       | -    | .016 |
| 5576510 | 4V0507002ST | -       | -         | 1/4  | 1/4  | 3/4                      | 2 1/2       | -    | -    |
| 5576577 | 4V1507002AT | -       | -         | 1/4  | 1/4  | 1 1/4                    | 3 1/4       | .015 | -    |

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(Series 4V05 4V15 4V45 4V65 • VariMill I • Victory Grades — continued)

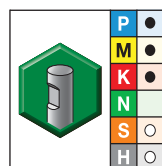
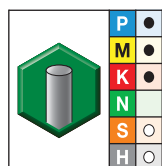
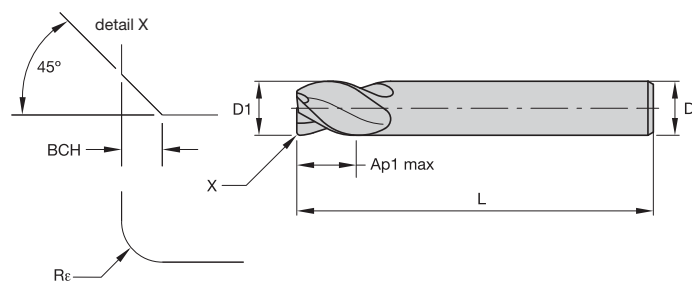


- first choice
- alternate choice

| grade WP15PE<br>AlTiN |             | grade WP15PE<br>AlTiN |             | D1   | D    | length of cut<br>Ap1 max | length<br>L | Re   | BCH  |
|-----------------------|-------------|-----------------------|-------------|------|------|--------------------------|-------------|------|------|
| order #               | catalog #   | order #               | catalog #   |      |      |                          |             |      |      |
| 5576579               | 4V1507002BT | —                     | —           | 1/4  | 1/4  | 1 1/4                    | 3 1/4       | .030 | —    |
| 5576566               | 4V1507002ST | —                     | —           | 1/4  | 1/4  | 1 1/4                    | 3 1/4       | —    | —    |
| 5576611               | 4V4508003BT | —                     | —           | 5/16 | 5/16 | 1/2                      | 2           | .030 | —    |
| 5576597               | 4V4508003NT | —                     | —           | 5/16 | 5/16 | 1/2                      | 2           | —    | .016 |
| 5576598               | 4V4508003ST | —                     | —           | 5/16 | 5/16 | 1/2                      | 2           | —    | —    |
| 5576536               | 4V0508003AT | —                     | —           | 5/16 | 5/16 | 3/4                      | 2 1/2       | .015 | —    |
| 5576537               | 4V0508003BT | —                     | —           | 5/16 | 5/16 | 3/4                      | 2 1/2       | .030 | —    |
| 5576538               | 4V0508003CT | —                     | —           | 5/16 | 5/16 | 3/4                      | 2 1/2       | .060 | —    |
| 5576511               | 4V0508003NT | —                     | —           | 5/16 | 5/16 | 3/4                      | 2 1/2       | —    | .016 |
| 5576512               | 4V0508003ST | —                     | —           | 5/16 | 5/16 | 3/4                      | 2 1/2       | —    | —    |
| 5576580               | 4V1508003BT | —                     | —           | 5/16 | 5/16 | 1 1/4                    | 3 1/4       | .030 | —    |
| 5576567               | 4V1508003ST | —                     | —           | 5/16 | 5/16 | 1 1/4                    | 3 1/4       | —    | —    |
| 5576612               | 4V4510004BT | —                     | —           | 3/8  | 3/8  | 1/2                      | 2           | .030 | —    |
| 5576599               | 4V4510004NT | —                     | —           | 3/8  | 3/8  | 1/2                      | 2           | —    | .020 |
| 5576600               | 4V4510004ST | —                     | —           | 3/8  | 3/8  | 1/2                      | 2           | —    | —    |
| 5576539               | 4V0510004AT | —                     | —           | 3/8  | 3/8  | 7/8                      | 2 1/2       | .015 | —    |
| 5576540               | 4V0510004BT | —                     | —           | 3/8  | 3/8  | 7/8                      | 2 1/2       | .030 | —    |
| 5576542               | 4V0510004CT | —                     | —           | 3/8  | 3/8  | 7/8                      | 2 1/2       | .060 | —    |
| 5576543               | 4V0510004DT | —                     | —           | 3/8  | 3/8  | 7/8                      | 2 1/2       | .090 | —    |
| 5576513               | 4V0510004NT | —                     | —           | 3/8  | 3/8  | 7/8                      | 2 1/2       | —    | .020 |
| 5576514               | 4V0510004ST | —                     | —           | 3/8  | 3/8  | 7/8                      | 2 1/2       | —    | —    |
| 5576581               | 4V1510004BT | —                     | —           | 3/8  | 3/8  | 1 1/2                    | 4           | .030 | —    |
| 5576582               | 4V1510004CT | —                     | —           | 3/8  | 3/8  | 1 1/2                    | 4           | .060 | —    |
| 5576568               | 4V1510004ST | —                     | —           | 3/8  | 3/8  | 1 1/2                    | 4           | —    | —    |
| 5576601               | 4V451101ANT | —                     | —           | 7/16 | 7/16 | 5/8                      | 2 1/2       | —    | .020 |
| 5576602               | 4V451101AST | —                     | —           | 7/16 | 7/16 | 5/8                      | 2 1/2       | —    | —    |
| 5576515               | 4V051101ANT | —                     | —           | 7/16 | 7/16 | 7/8                      | 2 1/2       | —    | .020 |
| 5576516               | 4V051101AST | —                     | —           | 7/16 | 7/16 | 7/8                      | 2 1/2       | —    | —    |
| 5576569               | 4V151100AST | —                     | —           | 7/16 | 7/16 | 2                        | 4           | —    | —    |
| —                     | —           | 5576613               | 4V4513005BW | 1/2  | 1/2  | 5/8                      | 2 1/2       | .030 | —    |
| —                     | —           | 5576614               | 4V4513005CW | 1/2  | 1/2  | 5/8                      | 2 1/2       | .060 | —    |
| —                     | —           | 5576604               | 4V4513005NW | 1/2  | 1/2  | 5/8                      | 2 1/2       | —    | .020 |

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(Series 4V05 4V15 4V45 4V65 • VariMill I • Victory Grades — continued)

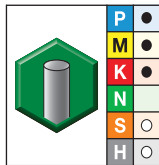
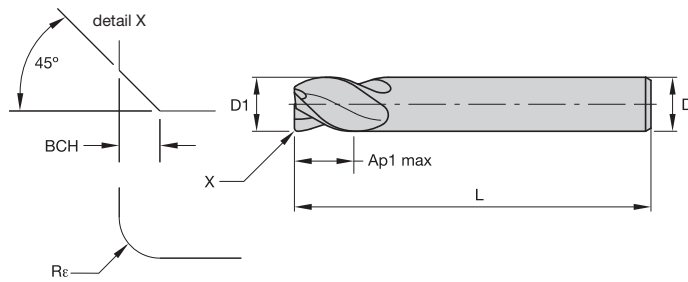
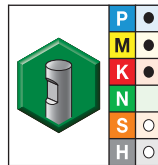


- first choice
- alternate choice

| grade WP15PE<br>AlTiN |           | grade WP15PE<br>AlTiN |             | D1  | D   | length of cut<br>Ap1 max | length<br>L | Rε   | BCH  |
|-----------------------|-----------|-----------------------|-------------|-----|-----|--------------------------|-------------|------|------|
| order #               | catalog # | order #               | catalog #   |     |     |                          |             |      |      |
| -                     | -         | 5576605               | 4V4513005SW | 1/2 | 1/2 | 5/8                      | 2 1/2       | —    | —    |
| -                     | -         | 5576518               | 4V0513005SW | 1/2 | 1/2 | 1                        | 3           | —    | —    |
| -                     | -         | 5576517               | 4V0513005NW | 1/2 | 1/2 | 1                        | 3           | —    | .020 |
| -                     | -         | 5576544               | 4V0513015AW | 1/2 | 1/2 | 1 1/4                    | 3           | .015 | —    |
| -                     | -         | 5576545               | 4V0513015BW | 1/2 | 1/2 | 1 1/4                    | 3           | .030 | —    |
| -                     | -         | 5576546               | 4V0513015CW | 1/2 | 1/2 | 1 1/4                    | 3           | .060 | —    |
| -                     | -         | 5576547               | 4V0513015DW | 1/2 | 1/2 | 1 1/4                    | 3           | .090 | —    |
| -                     | -         | 5576548               | 4V0513015EW | 1/2 | 1/2 | 1 1/4                    | 3           | .120 | —    |
| -                     | -         | 5576519               | 4V0513015NW | 1/2 | 1/2 | 1 1/4                    | 3           | —    | .020 |
| -                     | -         | 5576520               | 4V0513015SW | 1/2 | 1/2 | 1 1/4                    | 3           | —    | —    |
| -                     | -         | 5576636               | 4V6513015BW | 1/2 | 1/2 | 1 1/2                    | 4           | .030 | —    |
| -                     | -         | 5576637               | 4V6513015CW | 1/2 | 1/2 | 1 1/2                    | 4           | .060 | —    |
| -                     | -         | 5576621               | 4V6513015NW | 1/2 | 1/2 | 1 1/2                    | 4           | —    | .020 |
| -                     | -         | 5576622               | 4V6513015SW | 1/2 | 1/2 | 1 1/2                    | 4           | —    | —    |
| -                     | -         | 5576583               | 4V1513005BW | 1/2 | 1/2 | 2                        | 4           | .030 | —    |
| -                     | -         | 5576584               | 4V1513005CW | 1/2 | 1/2 | 2                        | 4           | .060 | —    |
| -                     | -         | 5576570               | 4V1513005SW | 1/2 | 1/2 | 2                        | 4           | —    | —    |
| -                     | -         | 5576638               | 4V6513025BW | 1/2 | 1/2 | 2 1/4                    | 4 1/2       | .030 | —    |
| -                     | -         | 5576639               | 4V6513025CW | 1/2 | 1/2 | 2 1/4                    | 4 1/2       | .060 | —    |
| -                     | -         | 5576623               | 4V6513025SW | 1/2 | 1/2 | 2 1/4                    | 4 1/2       | —    | —    |
| -                     | -         | 5576615               | 4V4516006CW | 5/8 | 5/8 | 3/4                      | 3           | .060 | —    |
| -                     | -         | 5576617               | 4V4516006EW | 5/8 | 5/8 | 3/4                      | 3           | .120 | —    |
| -                     | -         | 5576606               | 4V4516006NW | 5/8 | 5/8 | 3/4                      | 3           | —    | .020 |
| -                     | -         | 5576607               | 4V4516006SW | 5/8 | 5/8 | 3/4                      | 3           | —    | —    |
| -                     | -         | 5576549               | 4V0516006BW | 5/8 | 5/8 | 1 1/4                    | 3 1/2       | .030 | —    |
| -                     | -         | 5576550               | 4V0516006CW | 5/8 | 5/8 | 1 1/4                    | 3 1/2       | .060 | —    |
| -                     | -         | 5576551               | 4V0516006DW | 5/8 | 5/8 | 1 1/4                    | 3 1/2       | .090 | —    |
| -                     | -         | 5576552               | 4V0516006EW | 5/8 | 5/8 | 1 1/4                    | 3 1/2       | .120 | —    |
| -                     | -         | 5576528               | 4V0516006SW | 5/8 | 5/8 | 1 1/4                    | 3 1/2       | —    | —    |
| -                     | -         | 5576521               | 4V0516006NW | 5/8 | 5/8 | 1 1/4                    | 3 1/4       | —    | .020 |
| -                     | -         | 5576650               | 4V6516016CW | 5/8 | 5/8 | 1 5/8                    | 4 1/8       | .060 | —    |
| -                     | -         | 5576624               | 4V6516016NW | 5/8 | 5/8 | 1 5/8                    | 4 1/8       | —    | .020 |

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(Series 4V05 4V15 4V45 4V65 • VariMill I • Victory Grades — continued)

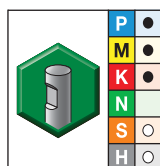
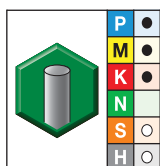
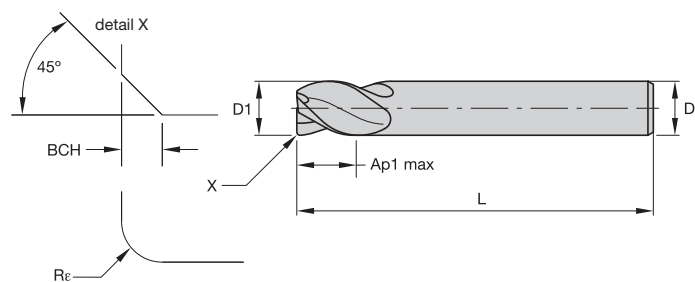

 grade WP15PE  
AlTiN

 grade WP15PE  
AlTiN

- first choice
- alternate choice

| order # | catalog # | order # | catalog #   | D1  | D   | length of cut<br>Ap1 max | length<br>L | Re   | BCH  |
|---------|-----------|---------|-------------|-----|-----|--------------------------|-------------|------|------|
| -       | -         | 5576625 | 4V6516016SW | 5/8 | 5/8 | 1 5/8                    | 4 1/8       | —    | —    |
| -       | -         | 5576585 | 4V1516006CW | 5/8 | 5/8 | 2 1/4                    | 5           | .060 | —    |
| -       | -         | 5576571 | 4V1516006NW | 5/8 | 5/8 | 2 1/4                    | 5           | —    | .020 |
| -       | -         | 5576572 | 4V1516006SW | 5/8 | 5/8 | 2 1/4                    | 5           | —    | —    |
| -       | -         | 5576618 | 4V4519007BW | 3/4 | 3/4 | 7/8                      | 3 1/2       | .030 | —    |
| -       | -         | 5576619 | 4V4519007CW | 3/4 | 3/4 | 7/8                      | 3 1/2       | .060 | —    |
| -       | -         | 5576620 | 4V4519007EW | 3/4 | 3/4 | 7/8                      | 3 1/2       | .120 | —    |
| -       | -         | 5576608 | 4V4519007NW | 3/4 | 3/4 | 7/8                      | 3 1/2       | —    | .020 |
| -       | -         | 5576609 | 4V4519007SW | 3/4 | 3/4 | 7/8                      | 3 1/2       | —    | —    |
| -       | -         | 5576553 | 4V0519007BW | 3/4 | 3/4 | 1 1/2                    | 4           | .030 | —    |
| -       | -         | 5576554 | 4V0519007CW | 3/4 | 3/4 | 1 1/2                    | 4           | .060 | —    |
| -       | -         | 5576555 | 4V0519007DW | 3/4 | 3/4 | 1 1/2                    | 4           | .090 | —    |
| -       | -         | 5576557 | 4V0519007EW | 3/4 | 3/4 | 1 1/2                    | 4           | .120 | —    |
| -       | -         | 5576529 | 4V0519007SW | 3/4 | 3/4 | 1 1/2                    | 4           | —    | —    |
| -       | -         | 5576522 | 4V0519007NW | 3/4 | 3/4 | 1 1/2                    | 4           | —    | .020 |
| -       | -         | 5576630 | 4V6519017NW | 3/4 | 3/4 | 1 5/8                    | 4           | —    | .020 |
| -       | -         | 5576631 | 4V6519017SW | 3/4 | 3/4 | 1 5/8                    | 4           | —    | —    |
| -       | -         | 5576586 | 4V1519007BW | 3/4 | 3/4 | 2 1/4                    | 5           | .030 | —    |
| -       | -         | 5576587 | 4V1519007CW | 3/4 | 3/4 | 2 1/4                    | 5           | .060 | —    |
| -       | -         | 5576573 | 4V1519007NW | 3/4 | 3/4 | 2 1/4                    | 5           | —    | .020 |
| -       | -         | 5576574 | 4V1519007SW | 3/4 | 3/4 | 2 1/4                    | 5           | —    | —    |
| -       | -         | 5576651 | 4V6519007BW | 3/4 | 3/4 | 3                        | 6           | .030 | —    |
| -       | -         | 5576652 | 4V6519007CW | 3/4 | 3/4 | 3                        | 6           | .060 | —    |
| -       | -         | 5576626 | 4V6519007NW | 3/4 | 3/4 | 3                        | 6           | —    | .020 |
| -       | -         | 5576627 | 4V6519007SW | 3/4 | 3/4 | 3                        | 6           | —    | —    |
| -       | -         | 5576558 | 4V0525008BW | 1   | 1   | 1 1/2                    | 4           | .030 | —    |
| -       | -         | 5576560 | 4V0525008CW | 1   | 1   | 1 1/2                    | 4           | .060 | —    |
| -       | -         | 5576561 | 4V0525008DW | 1   | 1   | 1 1/2                    | 4           | .090 | —    |
| -       | -         | 5576562 | 4V0525008EW | 1   | 1   | 1 1/2                    | 4           | .120 | —    |
| -       | -         | 5576563 | 4V0525008FW | 1   | 1   | 1 1/2                    | 4           | .250 | —    |
| -       | -         | 5576525 | 4V0525008SW | 1   | 1   | 1 1/2                    | 4           | —    | —    |
| -       | -         | 5576523 | 4V0525008NW | 1   | 1   | 1 1/2                    | 4           | —    | .020 |

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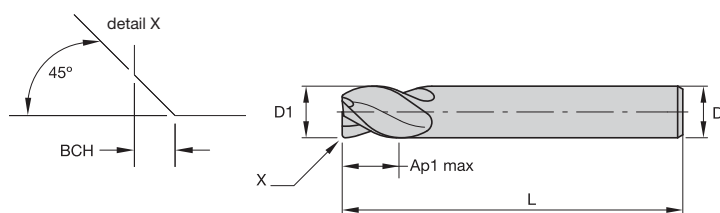
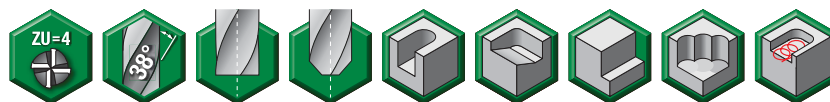
(Series 4V05 4V15 4V45 4V65 • VariMill I • Victory Grades — continued)



- first choice
- alternate choice

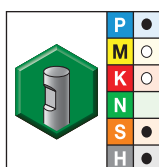
| grade WP15PE<br>AlTiN |           | grade WP15PE<br>AlTiN |             | D1    | D     | length of cut<br>Ap1 max | length<br>L | Re   | BCH  |
|-----------------------|-----------|-----------------------|-------------|-------|-------|--------------------------|-------------|------|------|
| order #               | catalog # | order #               | catalog #   |       |       |                          |             |      |      |
| —                     | —         | 5576632               | 4V6525018NW | 1     | 1     | 2                        | 5           | —    | .020 |
| —                     | —         | 5576633               | 4V6525018SW | 1     | 1     | 2                        | 5           | —    | —    |
| —                     | —         | 5576588               | 4V1525008BW | 1     | 1     | 2 1/4                    | 5           | .030 | —    |
| —                     | —         | 5576589               | 4V1525008CW | 1     | 1     | 2 1/4                    | 5           | .060 | —    |
| —                     | —         | 5576576               | 4V1525008SW | 1     | 1     | 2 1/4                    | 5           | —    | —    |
| —                     | —         | 5576575               | 4V1525008NW | 1     | 1     | 2 1/4                    | 5           | —    | .020 |
| —                     | —         | 5576653               | 4V6525028BW | 1     | 1     | 4                        | 7           | .030 | —    |
| —                     | —         | 5576654               | 4V6525028CW | 1     | 1     | 4                        | 7           | .060 | —    |
| —                     | —         | 5576634               | 4V6525028NW | 1     | 1     | 4                        | 7           | —    | .020 |
| —                     | —         | 5576635               | 4V6525028SW | 1     | 1     | 4                        | 7           | —    | —    |
| —                     | —         | 5576564               | 4V0532009BW | 1 1/4 | 1 1/4 | 2 1/4                    | 5           | .030 | —    |
| —                     | —         | 5576565               | 4V0532009EW | 1 1/4 | 1 1/4 | 2 1/4                    | 5           | .120 | —    |
| —                     | —         | 5576526               | 4V0532009NW | 1 1/4 | 1 1/4 | 2 1/4                    | 5           | —    | .020 |
| —                     | —         | 5576527               | 4V0532009SW | 1 1/4 | 1 1/4 | 2 1/4                    | 5           | —    | —    |

- Unequal flute spacing.
- Center cutting.
- Optimized geometry for titanium machining.
- Single tool for both roughing and finishing operations requiring fewer setups.
- Standard items listed. Additional styles and coatings made to order.


**End Mill Tolerances**

| D1  | tolerance    | D               | tolerance h6<br>+ / - |
|-----|--------------|-----------------|-----------------------|
| All | +.000/- .002 | ≤ 1/8"          | 0/.00024              |
|     |              | > 1/8–1/4"      | 0/.00031              |
|     |              | > 1/4–3/8"      | 0/.00035              |
|     |              | > 3/8–23/32"    | 0/.00043              |
|     |              | > 23/32–1 3/16" | 0/.00051              |

### ■ Series 4V0T 4V4T • VariMill I



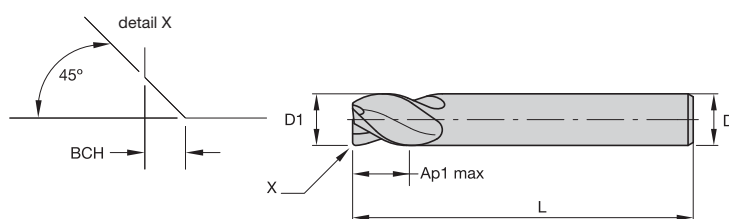
grade AITiN-MW  
AITiN

● first choice

○ alternate choice

| order # | catalog #    | D1    | D     | length of cut<br>Ap1 max | length<br>L | BCH  |
|---------|--------------|-------|-------|--------------------------|-------------|------|
| 2870168 | TM4V4T13005  | 1/2   | 1/2   | 5/8                      | 2 1/2       | .020 |
| 2870167 | TM4V4T13005S | 1/2   | 1/2   | 5/8                      | 2 1/2       | —    |
| 2832003 | TM4V0T13015  | 1/2   | 1/2   | 1 1/4                    | 3           | .020 |
| 2831994 | TM4V0T13015S | 1/2   | 1/2   | 1 1/4                    | 3           | —    |
| 2870166 | TM4V4T16006  | 5/8   | 5/8   | 3/4                      | 3           | .020 |
| 2870165 | TM4V4T16006S | 5/8   | 5/8   | 3/4                      | 3           | —    |
| 2831988 | TM4V0T16006  | 5/8   | 5/8   | 1 1/4                    | 3 1/2       | .020 |
| 2831980 | TM4V0T16006S | 5/8   | 5/8   | 1 1/4                    | 3 1/2       | —    |
| 2870164 | TM4V4T19007  | 3/4   | 3/4   | 7/8                      | 3 1/2       | .020 |
| 2870163 | TM4V4T19007S | 3/4   | 3/4   | 7/8                      | 3 1/2       | —    |
| 2831974 | TM4V0T19007  | 3/4   | 3/4   | 1 1/2                    | 4           | .020 |
| 2831967 | TM4V0T19007S | 3/4   | 3/4   | 1 1/2                    | 4           | —    |
| 2831961 | TM4V0T25008  | 1     | 1     | 1 1/2                    | 4           | .020 |
| 2831954 | TM4V0T25008S | 1     | 1     | 1 1/2                    | 4           | —    |
| 2831947 | TM4V0T32009  | 1 1/4 | 1 1/4 | 2 1/4                    | 5           | .020 |
| 3003329 | TM4V0T32009S | 1 1/4 | 1 1/4 | 2 1/4                    | 5           | —    |

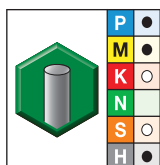
- Unequal flute spacing.
- Center cutting.
- Single tool for both roughing and finishing operations requiring fewer setups.
- Standard items listed. Additional styles and coatings made to order.



End Mill Tolerances

| D1  | tolerance    | D               | tolerance h6<br>+ / - |
|-----|--------------|-----------------|-----------------------|
| All | +.000/- .002 | ≤ 1/8"          | 0/.00024              |
|     |              | > 1/8–1/4"      | 0/.00031              |
|     |              | > 1/4–3/8"      | 0/.00035              |
|     |              | > 3/8–23/32"    | 0/.00043              |
|     |              | > 23/32–1 3/16" | 0/.00051              |

### Series 4VP5 • VariMill I • Extended Reach



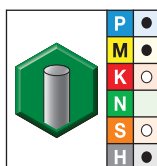
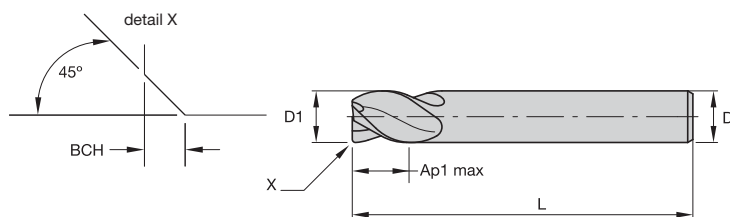
grade TiAlN-LT  
TiAlN

- first choice
- alternate choice

| order # | catalog #    | D1  | D   | length of cut<br>Ap1 max | length<br>L | BCH  |
|---------|--------------|-----|-----|--------------------------|-------------|------|
| 2837046 | TF4VP507012S | 1/4 | 1/4 | 3/8                      | 4           | —    |
| 2837055 | TF4VP507012  | 1/4 | 1/4 | 3/8                      | 4           | .016 |
| 2837032 | TF4VP510014S | 3/8 | 3/8 | 1/2                      | 4           | —    |
| 2837038 | TF4VP510014  | 3/8 | 3/8 | 1/2                      | 4           | .020 |
| 2837017 | TF4VP513005S | 1/2 | 1/2 | 5/8                      | 5           | —    |
| 2837025 | TF4VP513005  | 1/2 | 1/2 | 5/8                      | 5           | .020 |
| 2837002 | TF4VP513015S | 1/2 | 1/2 | 5/8                      | 6           | —    |
| 2837007 | TF4VP513015  | 1/2 | 1/2 | 5/8                      | 6           | .020 |
| 2836985 | TF4VP516006S | 5/8 | 5/8 | 3/4                      | 5           | —    |
| 2836992 | TF4VP516006  | 5/8 | 5/8 | 3/4                      | 5           | .020 |
| 2836970 | TF4VP516016S | 5/8 | 5/8 | 3/4                      | 6           | —    |
| 2836977 | TF4VP516016  | 5/8 | 5/8 | 3/4                      | 6           | .020 |
| 2836951 | TF4VP516026S | 5/8 | 5/8 | 3/4                      | 7           | —    |
| 2836956 | TF4VP516026  | 5/8 | 5/8 | 3/4                      | 7           | .020 |
| 2836936 | TF4VP519007S | 3/4 | 3/4 | 1                        | 5           | —    |
| 2836946 | TF4VP519007  | 3/4 | 3/4 | 1                        | 5           | .020 |

(continued)

(Series 4VP5 • VariMill I • Extended Reach — continued)

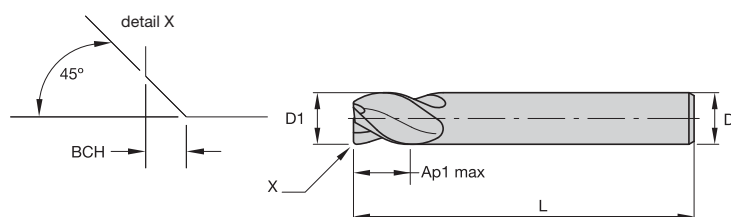


grade TiAlN-LT  
TiAlN

- first choice
- alternate choice

| order # | catalog #    | D1  | D   | length of cut<br>Ap1 max | length<br>L | BCH  |
|---------|--------------|-----|-----|--------------------------|-------------|------|
| 2836921 | TF4VP519017S | 3/4 | 3/4 | 1                        | 6           | —    |
| 2836930 | TF4VP519017  | 3/4 | 3/4 | 1                        | 6           | .020 |
| 2836907 | TF4VP519027S | 3/4 | 3/4 | 1                        | 7           | —    |
| 2836916 | TF4VP519027  | 3/4 | 3/4 | 1                        | 7           | .020 |
| 2836892 | TF4VP525008S | 1   | 1   | 1 1/8                    | 5           | —    |
| 2836900 | TF4VP525008  | 1   | 1   | 1 1/8                    | 5           | .020 |
| 2836879 | TF4VP525018S | 1   | 1   | 1 1/8                    | 6           | —    |
| 2836887 | TF4VP525018  | 1   | 1   | 1 1/8                    | 6           | .020 |
| 2836863 | TF4VP525028S | 1   | 1   | 1 1/8                    | 7           | —    |
| 2836872 | TF4VP525028  | 1   | 1   | 1 1/8                    | 7           | .020 |

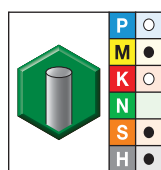
- Unequal flute spacing.
- Center cutting.
- Optimized geometry for titanium machining.
- Single tool for both roughing and finishing operations requiring fewer setups.
- Standard items listed. Additional styles and coatings made to order.



End Mill Tolerances

| D1  | tolerance    | D               | tolerance h6 + / - |
|-----|--------------|-----------------|--------------------|
| All | +0.00/-0.002 | ≤ 1/8"          | 0/.00024           |
|     |              | > 1/8-1/4"      | 0/.00031           |
|     |              | > 1/4-3/8"      | 0/.00035           |
|     |              | > 3/8-23/32"    | 0/.00043           |
|     |              | > 23/32-1 3/16" | 0/.00051           |

### Series 4VPT • VariMill I • Extended Reach

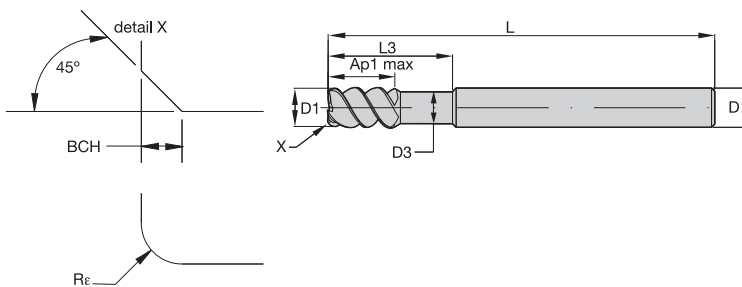


grade AITiN-MT  
AITiN

- first choice
- alternate choice

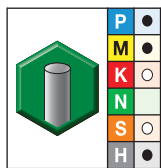
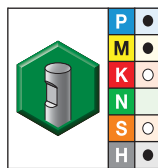
| order # | catalog #    | D1  | D   | length of cut<br>Ap1 max | length<br>L | BCH  |
|---------|--------------|-----|-----|--------------------------|-------------|------|
| 2831918 | TM4VPT13005  | 1/2 | 1/2 | 5/8                      | 5           | .020 |
| 2831913 | TM4VPT13005S | 1/2 | 1/2 | 5/8                      | 5           | —    |
| 2831907 | TM4VPT13015  | 1/2 | 1/2 | 5/8                      | 6           | .020 |
| 2831901 | TM4VPT13015S | 1/2 | 1/2 | 5/8                      | 6           | —    |
| 2831895 | TM4VPT16006  | 5/8 | 5/8 | 3/4                      | 5           | .020 |
| 3003330 | TM4VPT16006S | 5/8 | 5/8 | 3/4                      | 5           | —    |
| 2831889 | TM4VPT16016  | 5/8 | 5/8 | 3/4                      | 6           | .020 |
| 3003331 | TM4VPT16016S | 5/8 | 5/8 | 3/4                      | 6           | —    |
| 2831883 | TM4VPT16026  | 5/8 | 5/8 | 3/4                      | 7           | .020 |
| 2831878 | TM4VPT16026S | 5/8 | 5/8 | 3/4                      | 7           | —    |
| 2831871 | TM4VPT19007  | 3/4 | 3/4 | 1                        | 5           | .020 |
| 3003332 | TM4VPT19007S | 3/4 | 3/4 | 1                        | 5           | —    |
| 2831865 | TM4VPT19017  | 3/4 | 3/4 | 1                        | 6           | .020 |
| 3004373 | TM4VPT19017S | 3/4 | 3/4 | 1                        | 6           | —    |
| 2831858 | TM4VPT19027  | 3/4 | 3/4 | 1                        | 7           | .020 |
| 2988603 | TM4VPT19027S | 3/4 | 3/4 | 1                        | 7           | —    |
| 2831852 | TM4VPT25008  | 1   | 1   | 1 1/8                    | 5           | .020 |
| 3004374 | TM4VPT25008S | 1   | 1   | 1 1/8                    | 5           | —    |
| 2831847 | TM4VPT25018  | 1   | 1   | 1 1/8                    | 6           | .020 |
| 2831840 | TM4VPT25018S | 1   | 1   | 1 1/8                    | 6           | —    |
| 2831835 | TM4VPT25028  | 1   | 1   | 1 1/8                    | 7           | .020 |
| 3004375 | TM4VPT25028S | 1   | 1   | 1 1/8                    | 7           | —    |

- Unequal flute spacing.
- Center cutting.
- Single tool for both roughing and finishing operations requiring fewer setups.
- Standard items listed. Additional styles and coatings made to order.


**End Mill Tolerances**

| D1  | tolerance    | D               | tolerance h6 + / - |
|-----|--------------|-----------------|--------------------|
| All | +.000/- .002 | ≤ 1/8"          | 0/.00024           |
|     |              | > 1/8-1/4"      | 0/.00031           |
|     |              | > 1/4-3/8"      | 0/.00035           |
|     |              | > 3/8-23/32"    | 0/.00043           |
|     |              | > 23/32-1 3/16" | 0/.00051           |

### ■ Series 4VN5 • VariMill I • Extended Reach and Neck

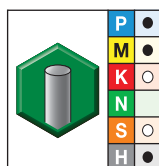
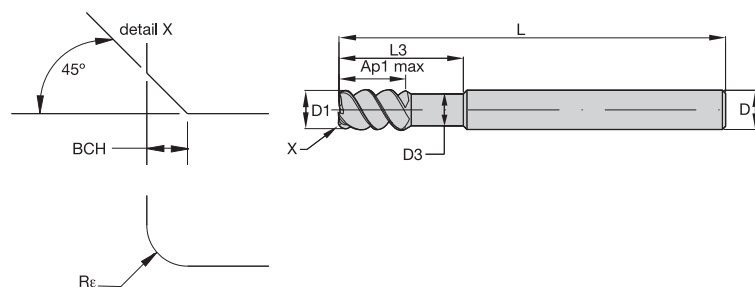

 grade TiAlN-LT  
TiAlN

 grade TiAlN-LW  
TiAlN

- first choice
- alternate choice

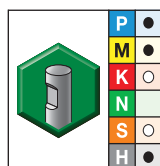
| order # | catalog #    | order # | catalog #    | D1  | D   | D3  | length of cut<br>Ap1 max | L3    | length<br>L | Rε   | BCH  |
|---------|--------------|---------|--------------|-----|-----|-----|--------------------------|-------|-------------|------|------|
| 3738940 | TF4VN507012A | -       | -            | 1/4 | 1/4 | .24 | 3/8                      | 1 1/4 | 4           | .015 | -    |
| 3738941 | TF4VN507012B | -       | -            | 1/4 | 1/4 | .24 | 3/8                      | 1 1/4 | 4           | .030 | -    |
| 2837188 | TF4VN507012  | -       | -            | 1/4 | 1/4 | .24 | 3/8                      | 1 1/4 | 4           | -    | .016 |
| 3738973 | TF4VN510014B | -       | -            | 3/8 | 3/8 | .35 | 1/2                      | 1 7/8 | 4           | .030 | -    |
| 3738974 | TF4VN510014C | -       | -            | 3/8 | 3/8 | .35 | 1/2                      | 1 7/8 | 4           | .060 | -    |
| 2837182 | TF4VN510014  | -       | -            | 3/8 | 3/8 | .35 | 1/2                      | 1 7/8 | 4           | -    | .020 |
| -       | -            | 3738975 | TF4VN513005B | 1/2 | 1/2 | .47 | 5/8                      | 2 1/4 | 4           | .030 | -    |
| -       | -            | 3738976 | TF4VN513005C | 1/2 | 1/2 | .47 | 5/8                      | 2 1/4 | 4           | .060 | -    |
| -       | -            | 3738977 | TF4VN513005E | 1/2 | 1/2 | .47 | 5/8                      | 2 1/4 | 4           | .120 | -    |
| -       | -            | 2837178 | TF4VN513005  | 1/2 | 1/2 | .47 | 5/8                      | 2 1/4 | 4           | -    | .020 |
| -       | -            | 3738978 | TF4VN516006C | 5/8 | 5/8 | .59 | 3/4                      | 2 1/4 | 4 1/8       | .060 | -    |
| -       | -            | 3738979 | TF4VN516006E | 5/8 | 5/8 | .59 | 3/4                      | 2 1/4 | 4 1/8       | .120 | -    |
| -       | -            | 2837171 | TF4VN516006  | 5/8 | 5/8 | .59 | 3/4                      | 2 1/4 | 4 1/8       | -    | .020 |
| -       | -            | 2837160 | TF4VN516016  | 5/8 | 5/8 | .59 | 3/4                      | 3 1/8 | 5           | -    | .020 |
| -       | -            | 2837154 | TF4VN519007  | 3/4 | 3/4 | .71 | 1                        | 2 1/4 | 4 1/4       | -    | .020 |
| -       | -            | 3738980 | TF4VN519017B | 3/4 | 3/4 | .71 | 1                        | 3 1/4 | 5 1/4       | .030 | -    |
| -       | -            | 3738981 | TF4VN519017C | 3/4 | 3/4 | .71 | 1                        | 3 1/4 | 5 1/4       | .060 | -    |
| -       | -            | 3738982 | TF4VN519017E | 3/4 | 3/4 | .71 | 1                        | 3 1/4 | 5 1/4       | .120 | -    |
| -       | -            | 2837146 | TF4VN519017  | 3/4 | 3/4 | .71 | 1                        | 3 1/4 | 5 1/4       | -    | .020 |
| -       | -            | 2837125 | TF4VN525008  | 1   | 1   | .94 | 1 1/8                    | 2 1/4 | 4 1/2       | -    | .020 |

(continued)

(Series 4VN5 • VariMill I • Extended Reach and Neck — continued)



grade TiAlN-LT  
TiAlN

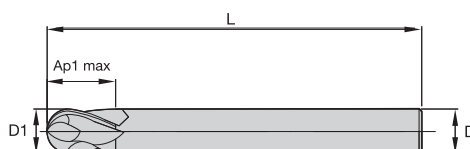
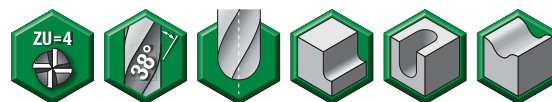


grade TiAlN-LW  
TiAlN

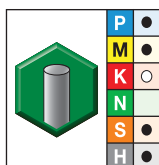
- first choice
- alternate choice

| grade TiAlN-LT<br>TiAlN |           | grade TiAlN-LW<br>TiAlN |              | D1 | D | D3  | length of cut<br>Ap1 max | L3    | length<br>L | Rε   | BCH  |
|-------------------------|-----------|-------------------------|--------------|----|---|-----|--------------------------|-------|-------------|------|------|
| order #                 | catalog # | order #                 | catalog #    |    |   |     |                          |       |             |      |      |
| -                       |           | 3738993                 | TF4VN525018B | 1  | 1 | .94 | 1 1/8                    | 3 1/4 | 5 1/2       | .030 | —    |
| -                       |           | 3738994                 | TF4VN525018C | 1  | 1 | .94 | 1 1/8                    | 3 1/4 | 5 1/2       | .060 | —    |
| -                       |           | 3738995                 | TF4VN525018E | 1  | 1 | .94 | 1 1/8                    | 3 1/4 | 5 1/2       | .120 | —    |
| -                       |           | 2837117                 | TF4VN525018  | 1  | 1 | .94 | 1 1/8                    | 3 1/4 | 5 1/2       | —    | .020 |
| -                       |           | 2837110                 | TF4VN525028  | 1  | 1 | .94 | 1 1/8                    | 4 1/4 | 6 1/2       | —    | .020 |

- Unequal flute spacing.
- Center cutting.
- Single tool for both roughing and finishing operations requiring fewer setups.
- Standard items listed. Additional styles and coatings made to order.


**End Mill Tolerances**

| D1  | tolerance     | D               | tolerance h6<br>+ / - |
|-----|---------------|-----------------|-----------------------|
| All | +0.000/-0.002 | ≤ 1/8"          | 0/0.00024             |
|     |               | > 1/8-1/4"      | 0/0.00031             |
|     |               | > 1/4-3/8"      | 0/0.00035             |
|     |               | > 3/8-23/32"    | 0/0.00043             |
|     |               | > 23/32-1 3/16" | 0/0.00051             |

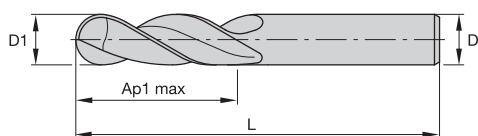
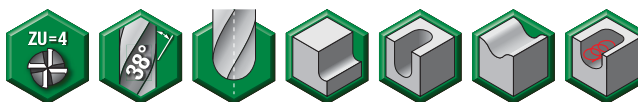
**■ Series 4VP0 • VariMill I • Extended Reach • Ball Nose**


grade TiAlN-LT  
TiAlN

- first choice
- alternate choice

| order # | catalog #   | D1  | D   | length of cut<br>Ap1 max | length<br>L |
|---------|-------------|-----|-----|--------------------------|-------------|
| 2837105 | TF4VP007012 | 1/4 | 1/4 | 3/8                      | 4           |
| 3018276 | TF4VP010014 | 3/8 | 3/8 | 1/2                      | 4           |
| 2837088 | TF4VP013005 | 1/2 | 1/2 | 5/8                      | 5           |
| 2837081 | TF4VP016016 | 5/8 | 5/8 | 3/4                      | 6           |
| 2837073 | TF4VP019017 | 3/4 | 3/4 | 1                        | 6           |
| 2837061 | TF4VP025018 | 1   | 1   | 1 1/8                    | 6           |

- Unequal flute spacing.
- Center cutting.
- Single tool for both roughing and finishing operations requiring fewer setups.
- Standard items listed. Additional styles and coatings made to order.

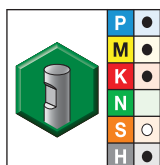
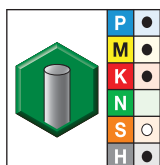


End Mill Tolerances

| D1  | tolerance     | D               | tolerance h6<br>+ / - |
|-----|---------------|-----------------|-----------------------|
| All | + .000/- .002 | ≤ 1/8"          | 0/.00024              |
|     |               | > 1/8-1/4"      | 0/.00031              |
|     |               | > 1/4-3/8"      | 0/.00035              |
|     |               | > 3/8-23/32"    | 0/.00043              |
|     |               | > 23/32-1 3/16" | 0/.00051              |



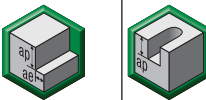
## Series 4V00 • VariMill I • Extended Length of Cut • Ball Nose • Victory Grades



- first choice
- alternate choice

| grade WP15PE<br>AITiN |             | grade WP15PE<br>AITiN |             | D1    | D     | length of cut<br>Ap1 max | length<br>L |
|-----------------------|-------------|-----------------------|-------------|-------|-------|--------------------------|-------------|
| order #               | catalog #   | order #               | catalog #   |       |       |                          |             |
| 5576655               | 4V0003001XT | -                     |             | 1/8   | 1/8   | 1/2                      | 2           |
| 5576656               | 4V0005000XT | -                     |             | 3/16  | 3/16  | 5/8                      | 2 1/4       |
| 5576658               | 4V0007002XT | -                     |             | 1/4   | 1/4   | 3/4                      | 2 1/2       |
| 5576659               | 4V0008003XT | -                     |             | 5/16  | 5/16  | 3/4                      | 2 1/2       |
| 5576660               | 4V0010004XT | -                     |             | 3/8   | 3/8   | 7/8                      | 2 1/2       |
| 5576661               | 4V001101AXT | -                     |             | 7/16  | 7/16  | 7/8                      | 2 1/2       |
| -                     |             | 5576662               | 4V0013005XW | 1/2   | 1/2   | 1                        | 3           |
| -                     |             | 5576663               | 4V0013015XW | 1/2   | 1/2   | 1 1/4                    | 3           |
| -                     |             | 5576664               | 4V0016006XW | 5/8   | 5/8   | 1 1/4                    | 3 1/2       |
| -                     |             | 5576665               | 4V0019007XW | 3/4   | 3/4   | 1 1/2                    | 4           |
| -                     |             | 5576666               | 4V0025008XW | 1     | 1     | 1 1/2                    | 4           |
| -                     |             | 5576667               | 4V0032009XW | 1 1/4 | 1 1/4 | 2 1/4                    | 5           |

**Series 4V05 • VariMill I • Victory Grades**


| Material Group |    |  |         |  |                              |      |       |                                                                                                          |               |       |       |       |       |       |       |        |        |       |       |  |
|----------------|----|-----------------------------------------------------------------------------------|---------|------------------------------------------------------------------------------------|------------------------------|------|-------|----------------------------------------------------------------------------------------------------------|---------------|-------|-------|-------|-------|-------|-------|--------|--------|-------|-------|--|
|                |    | Side Milling (A) and Slotting (B)                                                 |         |                                                                                    | WP15PE                       |      |       | Recommended feed per tooth (IPT = inch/th) for side milling (A).<br>For slotting (B), reduce IPT by 20%. |               |       |       |       |       |       |       |        |        |       |       |  |
|                |    |                                                                                   |         |                                                                                    |                              |      |       |                                                                                                          |               |       |       |       |       |       |       |        |        |       |       |  |
|                |    | A                                                                                 |         | B                                                                                  | Cutting Speed<br>— vc<br>SFM |      |       | frac.                                                                                                    | D1 — Diameter |       |       |       |       |       |       |        |        |       |       |  |
|                |    |                                                                                   |         |                                                                                    |                              |      |       |                                                                                                          | 1/8           | 3/16  | 1/4   | 5/16  | 7/16  | 3/8   | 1/2   | 5/8    | 3/4    | 1     | 1 1/4 |  |
| ap             | ae | ap                                                                                | min     |                                                                                    | max                          | dec. | .1250 | .1875                                                                                                    | .2500         | .3125 | .4375 | .3750 | .5000 | .6250 | .7500 | 1.0000 | 1.2500 |       |       |  |
| P              | 0  | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 490                          | –    | 660   | IPT                                                                                                      | .0009         | .0013 | .0018 | .0023 | .0031 | .0027 | .0034 | .0039  | .0044  | .0049 | .0049 |  |
|                | 1  | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 490                          | –    | 660   | IPT                                                                                                      | .0009         | .0013 | .0018 | .0023 | .0031 | .0027 | .0034 | .0039  | .0044  | .0049 | .0049 |  |
|                | 2  | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 460                          | –    | 620   | IPT                                                                                                      | .0009         | .0013 | .0018 | .0023 | .0031 | .0027 | .0034 | .0039  | .0044  | .0049 | .0049 |  |
|                | 3  | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 390                          | –    | 520   | IPT                                                                                                      | .0007         | .0011 | .0015 | .0020 | .0026 | .0023 | .0029 | .0034  | .0039  | .0045 | .0048 |  |
|                | 4  | 1.5 x D                                                                           | 0.5 x D | 0.75 x D                                                                           | 300                          | –    | 490   | IPT                                                                                                      | .0007         | .0010 | .0014 | .0017 | .0023 | .0020 | .0026 | .0030  | .0034  | .0039 | .0040 |  |
|                | 5  | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 200                          | –    | 330   | IPT                                                                                                      | .0006         | .0009 | .0012 | .0016 | .0021 | .0018 | .0023 | .0027  | .0031  | .0036 | .0039 |  |
| M              | 6  | 1.5 x D                                                                           | 0.5 x D | 0.75 x D                                                                           | 160                          | –    | 250   | IPT                                                                                                      | .0005         | .0008 | .0010 | .0013 | .0017 | .0015 | .0019 | .0022  | .0025  | .0028 | .0029 |  |
|                | 1  | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 300                          | –    | 380   | IPT                                                                                                      | .0007         | .0011 | .0015 | .0020 | .0026 | .0023 | .0029 | .0034  | .0039  | .0045 | .0048 |  |
|                | 2  | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 200                          | –    | 260   | IPT                                                                                                      | .0006         | .0009 | .0012 | .0016 | .0021 | .0018 | .0023 | .0027  | .0031  | .0036 | .0039 |  |
| K              | 3  | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 200                          | –    | 230   | IPT                                                                                                      | .0005         | .0008 | .0010 | .0013 | .0017 | .0015 | .0019 | .0022  | .0025  | .0028 | .0029 |  |
|                | 1  | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 390                          | –    | 490   | IPT                                                                                                      | .0009         | .0013 | .0018 | .0023 | .0031 | .0027 | .0034 | .0039  | .0044  | .0049 | .0049 |  |
|                | 2  | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 360                          | –    | 460   | IPT                                                                                                      | .0007         | .0011 | .0015 | .0020 | .0026 | .0023 | .0029 | .0034  | .0039  | .0045 | .0048 |  |
| S              | 3  | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 360                          | –    | 430   | IPT                                                                                                      | .0006         | .0009 | .0012 | .0016 | .0021 | .0018 | .0023 | .0027  | .0031  | .0036 | .0039 |  |
|                | 1  | 1.5 x D                                                                           | 0.3 x D | 0.3 x D                                                                            | 160                          | –    | 300   | IPT                                                                                                      | .0007         | .0011 | .0015 | .0020 | .0026 | .0023 | .0029 | .0034  | .0039  | .0045 | .0048 |  |
|                | 2  | 1.5 x D                                                                           | 0.3 x D | 0.3 x D                                                                            | 80                           | –    | 130   | IPT                                                                                                      | .0004         | .0006 | .0008 | .0010 | .0014 | .0012 | .0015 | .0018  | .0021  | .0024 | .0026 |  |
|                | 3  | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 200                          | –    | 260   | IPT                                                                                                      | .0006         | .0009 | .0012 | .0016 | .0021 | .0018 | .0023 | .0027  | .0031  | .0036 | .0039 |  |
| H              | 4  | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 160                          | –    | 200   | IPT                                                                                                      | .0005         | .0008 | .0011 | .0014 | .0019 | .0017 | .0021 | .0025  | .0028  | .0033 | .0036 |  |
|                | 1  | 1.5 x D                                                                           | 0.5 x D | 0.75 x D                                                                           | 260                          | –    | 460   | IPT                                                                                                      | .0007         | .0010 | .0014 | .0017 | .0023 | .0020 | .0026 | .0030  | .0034  | .0039 | .0040 |  |
|                | 2  | 1.5 D                                                                             | 0.2 x D | 0.5 x D                                                                            | 230                          | –    | 390   | IPT                                                                                                      | .0005         | .0008 | .0010 | .0013 | .0017 | .0015 | .0019 | .0022  | .0025  | .0028 | .0029 |  |

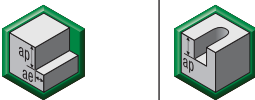
NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.  
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.  
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

### ■ Series 4V0T 4V4T • VariMill I

| Material Group |   |  |         |  |                           |  |      |                                                                                                          |       |       |       |       |       |
|----------------|---|-----------------------------------------------------------------------------------|---------|-----------------------------------------------------------------------------------|---------------------------|------------------------------------------------------------------------------------|------|----------------------------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|
|                |   | Side Milling (A) and Slotting (B)                                                 |         |                                                                                   | AITiN                     |                                                                                    |      | Recommended feed per tooth (IPT = inch/th) for side milling (A).<br>For slotting (B), reduce IPT by 20%. |       |       |       |       |       |
|                |   |                                                                                   |         |                                                                                   |                           |                                                                                    |      | D1 – Diameter                                                                                            |       |       |       |       |       |
|                |   | A                                                                                 |         | B                                                                                 | Cutting Speed – vc<br>SFM |                                                                                    |      | frac.                                                                                                    |       |       |       |       |       |
| ap             |   | ae                                                                                | ap      | min                                                                               |                           | max                                                                                | dec. | 1/2                                                                                                      | 5/8   | 3/4   | 1     | 1-1/4 |       |
| P              | 0 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                             | 490                       | –                                                                                  | 660  | IPT                                                                                                      | .0034 | .0039 | .0044 | .0049 | .0049 |
|                | 1 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                             | 490                       | –                                                                                  | 660  | IPT                                                                                                      | .0034 | .0039 | .0044 | .0049 | .0049 |
|                | 2 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                             | 460                       | –                                                                                  | 620  | IPT                                                                                                      | .0034 | .0039 | .0044 | .0049 | .0049 |
|                | 3 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                             | 390                       | –                                                                                  | 520  | IPT                                                                                                      | .0029 | .0034 | .0039 | .0045 | .0048 |
|                | 4 | 1.5 x D                                                                           | 0.5 x D | 0.75 x D                                                                          | 300                       | –                                                                                  | 490  | IPT                                                                                                      | .0026 | .0030 | .0034 | .0039 | .0040 |
|                | 5 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                             | 200                       | –                                                                                  | 330  | IPT                                                                                                      | .0023 | .0027 | .0031 | .0036 | .0039 |
| M              | 6 | 1.5 x D                                                                           | 0.5 x D | 0.75 x D                                                                          | 160                       | –                                                                                  | 250  | IPT                                                                                                      | .0019 | .0022 | .0025 | .0028 | .0029 |
|                | 1 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                             | 300                       | –                                                                                  | 380  | IPT                                                                                                      | .0029 | .0034 | .0039 | .0045 | .0048 |
|                | 2 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                             | 200                       | –                                                                                  | 260  | IPT                                                                                                      | .0023 | .0027 | .0031 | .0036 | .0039 |
| K              | 3 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                             | 200                       | –                                                                                  | 230  | IPT                                                                                                      | .0019 | .0022 | .0025 | .0028 | .0029 |
|                | 1 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                             | 390                       | –                                                                                  | 490  | IPT                                                                                                      | .0034 | .0039 | .0044 | .0049 | .0049 |
|                | 2 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                             | 360                       | –                                                                                  | 460  | IPT                                                                                                      | .0029 | .0034 | .0039 | .0045 | .0048 |
| S              | 3 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                             | 360                       | –                                                                                  | 430  | IPT                                                                                                      | .0023 | .0027 | .0031 | .0036 | .0039 |
|                | 1 | 1.5 x D                                                                           | 0.3 x D | 0.3 x D                                                                           | 160                       | –                                                                                  | 300  | IPT                                                                                                      | .0029 | .0034 | .0039 | .0045 | .0048 |
|                | 2 | 1.5 x D                                                                           | 0.3 x D | 0.3 x D                                                                           | 80                        | –                                                                                  | 130  | IPT                                                                                                      | .0015 | .0018 | .0021 | .0024 | .0026 |
|                | 3 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                             | 200                       | –                                                                                  | 260  | IPT                                                                                                      | .0023 | .0027 | .0031 | .0036 | .0039 |
| H              | 4 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                             | 160                       | –                                                                                  | 200  | IPT                                                                                                      | .0021 | .0025 | .0028 | .0033 | .0036 |
|                | 1 | 1.5 x D                                                                           | 0.5 x D | 0.75 x D                                                                          | 260                       | –                                                                                  | 460  | IPT                                                                                                      | .0026 | .0030 | .0034 | .0039 | .0040 |
| H              | 2 | 1.5 x D                                                                           | 0.2 x D | 0.5 x D                                                                           | 230                       | –                                                                                  | 390  | IPT                                                                                                      | .0019 | .0022 | .0025 | .0028 | .0029 |

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.  
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.  
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

**■ Series 4VP5 • VariMill I**

| Material Group |   |  |         |          |  |   |     |                                                                                                          |               |       |       |       |       |       |
|----------------|---|-----------------------------------------------------------------------------------|---------|----------|------------------------------------------------------------------------------------|---|-----|----------------------------------------------------------------------------------------------------------|---------------|-------|-------|-------|-------|-------|
|                |   | Side Milling (A) and Slotting (B)                                                 |         |          | TiAlN                                                                              |   |     | Recommended feed per tooth (IPT = inch/th) for side milling (A).<br>For slotting (B), reduce IPT by 20%. |               |       |       |       |       |       |
|                |   | A                                                                                 |         | B        | Cutting Speed – vc<br>SFM                                                          |   |     |                                                                                                          | D1 – Diameter |       |       |       |       |       |
|                |   | ap                                                                                | ae      | ap       | min                                                                                |   | max | frac.                                                                                                    | 1/4           | 3/8   | 1/2   | 5/8   | 3/4   | 1     |
|                |   | ap                                                                                | ae      | ap       | min                                                                                |   | max | dec.                                                                                                     | .2500         | .3750 | .5000 | .6250 | .7500 | 1.000 |
| P              | 0 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 490                                                                                | – | 660 | IPT                                                                                                      | .0018         | .0027 | .0034 | .0039 | .0044 | .0049 |
|                | 1 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 490                                                                                | – | 660 | IPT                                                                                                      | .0018         | .0027 | .0034 | .0039 | .0044 | .0049 |
|                | 2 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 460                                                                                | – | 620 | IPT                                                                                                      | .0018         | .0027 | .0034 | .0039 | .0044 | .0049 |
|                | 3 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 390                                                                                | – | 520 | IPT                                                                                                      | .0015         | .0023 | .0029 | .0034 | .0039 | .0045 |
|                | 4 | 0.75 x D                                                                          | 0.5 x D | 0.5 x D  | 300                                                                                | – | 490 | IPT                                                                                                      | .0014         | .0020 | .0026 | .0030 | .0034 | .0039 |
|                | 5 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 200                                                                                | – | 330 | IPT                                                                                                      | .0012         | .0018 | .0023 | .0027 | .0031 | .0036 |
|                | 6 | 0.75 x D                                                                          | 0.5 x D | 0.5 x D  | 160                                                                                | – | 250 | IPT                                                                                                      | .0010         | .0015 | .0019 | .0022 | .0025 | .0028 |
| M              | 1 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 300                                                                                | – | 380 | IPT                                                                                                      | .0015         | .0023 | .0029 | .0034 | .0039 | .0045 |
|                | 2 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 200                                                                                | – | 260 | IPT                                                                                                      | .0012         | .0018 | .0023 | .0027 | .0031 | .0036 |
|                | 3 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 200                                                                                | – | 230 | IPT                                                                                                      | .0010         | .0015 | .0019 | .0022 | .0025 | .0028 |
| K              | 1 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 390                                                                                | – | 490 | IPT                                                                                                      | .0018         | .0027 | .0034 | .0039 | .0044 | .0049 |
|                | 2 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 360                                                                                | – | 460 | IPT                                                                                                      | .0015         | .0023 | .0029 | .0034 | .0039 | .0045 |
|                | 3 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 360                                                                                | – | 430 | IPT                                                                                                      | .0012         | .0018 | .0023 | .0027 | .0031 | .0036 |
| S              | 1 | 0.75 x D                                                                          | 0.3 x D | 0.3 x D  | 160                                                                                | – | 300 | IPT                                                                                                      | .0015         | .0023 | .0029 | .0034 | .0039 | .0045 |
|                | 2 | 0.75 x D                                                                          | 0.3 x D | 0.3 x D  | 80                                                                                 | – | 130 | IPT                                                                                                      | .0008         | .0012 | .0015 | .0018 | .0021 | .0024 |
|                | 3 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 200                                                                                | – | 260 | IPT                                                                                                      | .0012         | .0018 | .0023 | .0027 | .0031 | .0036 |
|                | 4 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 160                                                                                | – | 200 | IPT                                                                                                      | .0011         | .0017 | .0021 | .0025 | .0028 | .0033 |
| H              | 1 | 0.75 x D                                                                          | 0.5 x D | 0.5 x D  | 260                                                                                | – | 460 | IPT                                                                                                      | .0014         | .0020 | .0026 | .0030 | .0034 | .0039 |
|                | 2 | 0.75 x D                                                                          | 0.2 x D | 0.75 x D | 230                                                                                | – | 390 | IPT                                                                                                      | .0010         | .0015 | .0019 | .0022 | .0025 | .0028 |

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 1/2".

Side milling applications — for longest reach (L3) tools, reduce ae by 30%.

Slot milling applications — for longest reach (L3) tools, reduce ae by 30%.

### ■ Series 4VPT • VariMill I • Extended Reach

| Material Group |   |  |         |  |                        |   |     |                                                                                                       |               |       |       |       |
|----------------|---|-----------------------------------------------------------------------------------|---------|------------------------------------------------------------------------------------|------------------------|---|-----|-------------------------------------------------------------------------------------------------------|---------------|-------|-------|-------|
|                |   | Side Milling (A) and Slotting (B)                                                 |         |                                                                                    | AlTiN                  |   |     | Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%. |               |       |       |       |
|                |   | A                                                                                 |         | B                                                                                  | Cutting Speed — vc SFM |   |     | frac.                                                                                                 | D1 — Diameter |       |       |       |
|                |   | ap                                                                                | ae      | ap                                                                                 | min                    |   | max |                                                                                                       | 1/2           | 5/8   | 3/4   | 1     |
| P              | 1 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D                                                                           | 500                    | — | 650 | IPT                                                                                                   | .0035         | .0039 | .0043 | .0050 |
|                | 2 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D                                                                           | 450                    | — | 625 | IPT                                                                                                   | .0035         | .0039 | .0043 | .0050 |
|                | 3 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D                                                                           | 400                    | — | 525 | IPT                                                                                                   | .0029         | .0034 | .0038 | .0046 |
|                | 4 | 0.75 x D                                                                          | 0.5 x D | 0.5 x D                                                                            | 300                    | — | 475 | IPT                                                                                                   | .0026         | .0030 | .0033 | .0039 |
|                | 5 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D                                                                           | 200                    | — | 325 | IPT                                                                                                   | .0023         | .0027 | .0030 | .0036 |
|                | 6 | 0.75 x D                                                                          | 0.5 x D | 0.5 x D                                                                            | 150                    | — | 225 | IPT                                                                                                   | .0019         | .0022 | .0024 | .0028 |
| M              | 1 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D                                                                           | 260                    | — | 330 | IPT                                                                                                   | .0029         | .0034 | .0038 | .0046 |
|                | 2 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D                                                                           | 200                    | — | 260 | IPT                                                                                                   | .0023         | .0027 | .0030 | .0036 |
|                | 3 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D                                                                           | 200                    | — | 260 | IPT                                                                                                   | .0019         | .0022 | .0024 | .0028 |
| K              | 1 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D                                                                           | 390                    | — | 520 | IPT                                                                                                   | .0035         | .0039 | .0043 | .0050 |
|                | 2 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D                                                                           | 360                    | — | 460 | IPT                                                                                                   | .0029         | .0034 | .0038 | .0046 |
|                | 3 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D                                                                           | 330                    | — | 430 | IPT                                                                                                   | .0023         | .0027 | .0030 | .0036 |
| S              | 1 | 0.75 x D                                                                          | 0.3 x D | 0.3 x D                                                                            | 150                    | — | 275 | IPT                                                                                                   | .0029         | .0034 | .0038 | .0046 |
|                | 2 | 0.75 x D                                                                          | 0.3 x D | 0.3 x D                                                                            | 70                     | — | 130 | IPT                                                                                                   | .0016         | .0018 | .0020 | .0025 |
|                | 3 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D                                                                           | 160                    | — | 260 | IPT                                                                                                   | .0023         | .0027 | .0030 | .0036 |
|                | 4 | 0.75 x D                                                                          | 0.5 x D | 0.75 x D                                                                           | 150                    | — | 210 | IPT                                                                                                   | .0022         | .0025 | .0028 | .0033 |
| H              | 1 | 0.75 x D                                                                          | 0.5 x D | 0.5 x D                                                                            | 260                    | — | 450 | IPT                                                                                                   | .0026         | .0030 | .0033 | .0039 |

NOTE: Side milling applications — for longest reach (L3) tools, reduce ae by 30%.

Slot milling applications — for longest reach (L3) tools, reduce ap by 30%.

Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

**Series 4VN5 • VariMill I**

| Material Group |    |  |         |          |  |       |       |                                                                                                       |               |       |       |       |       |       |
|----------------|----|-----------------------------------------------------------------------------------|---------|----------|------------------------------------------------------------------------------------|-------|-------|-------------------------------------------------------------------------------------------------------|---------------|-------|-------|-------|-------|-------|
|                |    | Side Milling (A) and Slotting (B)                                                 |         |          | TiAlN                                                                              |       |       | Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%. |               |       |       |       |       |       |
|                |    |                                                                                   |         |          |                                                                                    |       |       |                                                                                                       |               |       |       |       |       |       |
|                |    | A                                                                                 |         | B        | Cutting Speed<br>— vc<br>SFM                                                       |       |       |                                                                                                       | D1 — Diameter |       |       |       |       |       |
| ap             | ae | ap                                                                                | min     |          | max                                                                                | frac. | 1/4   | 3/8                                                                                                   | 1/2           | 5/8   | 3/4   | 1     |       |       |
|                |    |                                                                                   |         |          |                                                                                    | dec.  | .2500 | .3750                                                                                                 | .5000         | .6250 | .7500 | 1.000 |       |       |
| P              | 1  | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 500                                                                                | –     | 650   | IPT                                                                                                   | .0018         | .0027 | .0035 | .0039 | .0043 | .0050 |
|                | 2  | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 450                                                                                | –     | 625   | IPT                                                                                                   | .0018         | .0027 | .0035 | .0039 | .0043 | .0050 |
|                | 3  | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 400                                                                                | –     | 525   | IPT                                                                                                   | .0015         | .0023 | .0029 | .0034 | .0038 | .0046 |
|                | 4  | 0.75 x D                                                                          | 0.5 x D | 0.5 x D  | 300                                                                                | –     | 475   | IPT                                                                                                   | .0014         | .0020 | .0026 | .0030 | .0033 | .0039 |
|                | 5  | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 200                                                                                | –     | 325   | IPT                                                                                                   | .0012         | .0018 | .0023 | .0027 | .0030 | .0036 |
|                | 6  | 0.75 x D                                                                          | 0.5 x D | 0.5 x D  | 150                                                                                | –     | 225   | IPT                                                                                                   | .0010         | .0015 | .0019 | .0022 | .0024 | .0028 |
| M              | 1  | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 260                                                                                | –     | 330   | IPT                                                                                                   | .0015         | .0023 | .0029 | .0034 | .0038 | .0046 |
|                | 2  | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 200                                                                                | –     | 260   | IPT                                                                                                   | .0012         | .0018 | .0023 | .0027 | .0030 | .0036 |
|                | 3  | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 200                                                                                | –     | 260   | IPT                                                                                                   | .0010         | .0015 | .0019 | .0022 | .0024 | .0028 |
| K              | 1  | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 390                                                                                | –     | 520   | IPT                                                                                                   | .0018         | .0027 | .0035 | .0039 | .0043 | .0050 |
|                | 2  | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 360                                                                                | –     | 460   | IPT                                                                                                   | .0015         | .0023 | .0029 | .0034 | .0038 | .0046 |
|                | 3  | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 330                                                                                | –     | 430   | IPT                                                                                                   | .0012         | .0018 | .0023 | .0027 | .0030 | .0036 |
| S              | 1  | 0.75 x D                                                                          | 0.3 x D | 0.3 x D  | 150                                                                                | –     | 275   | IPT                                                                                                   | .0015         | .0023 | .0029 | .0034 | .0038 | .0046 |
|                | 2  | 0.75 x D                                                                          | 0.3 x D | 0.3 x D  | 70                                                                                 | –     | 130   | IPT                                                                                                   | .0008         | .0012 | .0016 | .0018 | .0020 | .0025 |
|                | 3  | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 160                                                                                | –     | 260   | IPT                                                                                                   | .0012         | .0018 | .0023 | .0027 | .0030 | .0036 |
|                | 4  | 0.75 x D                                                                          | 0.5 x D | 0.75 x D | 150                                                                                | –     | 210   | IPT                                                                                                   | .0011         | .0017 | .0022 | .0025 | .0028 | .0033 |
| H              | 1  | 0.75 x D                                                                          | 0.5 x D | 0.5 x D  | 260                                                                                | –     | 450   | IPT                                                                                                   | .0014         | .0020 | .0026 | .0030 | .0033 | .0039 |

NOTE: Side milling applications — for longest reach (L3) tools, reduce ae by 30%.

Slot milling applications — for longest reach (L3) tools, reduce ap by 30%.

Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

### ■ Series 4VP0 • VariMill I

| Material Group |   |  |  |  |       |      |       |                                                                                                       |       |       |       |       |       |       |
|----------------|---|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------|------|-------|-------------------------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|
|                |   | Side Milling (A) and Slotting (B)                                                 |                                                                                   |                                                                                    | TiAlN |      |       | Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%. |       |       |       |       |       |       |
|                |   |                                                                                   |                                                                                   |                                                                                    |       |      |       | D1 — Diameter                                                                                         |       |       |       |       |       |       |
|                |   | ap                                                                                | ae                                                                                | ap                                                                                 | min   |      | max   | frac.                                                                                                 | 1/4   | 3/8   | 1/2   | 5/8   | 3/4   | 1     |
|                |   |                                                                                   |                                                                                   |                                                                                    |       | dec. | .2500 | .3750                                                                                                 | .5000 | .6250 | .7500 | 1.000 |       |       |
| P              | 0 | 0.75 x D                                                                          | 0.5 x D                                                                           | 0.75 x D                                                                           | 490   | –    | 660   | IPT                                                                                                   | .0018 | .0027 | .0034 | .0039 | .0044 | .0049 |
|                | 1 | 0.75 x D                                                                          | 0.5 x D                                                                           | 0.75 x D                                                                           | 490   | –    | 660   | IPT                                                                                                   | .0018 | .0027 | .0034 | .0039 | .0044 | .0049 |
|                | 2 | 0.75 x D                                                                          | 0.5 x D                                                                           | 0.75 x D                                                                           | 460   | –    | 620   | IPT                                                                                                   | .0018 | .0027 | .0034 | .0039 | .0044 | .0049 |
|                | 3 | 0.75 x D                                                                          | 0.5 x D                                                                           | 0.75 x D                                                                           | 390   | –    | 520   | IPT                                                                                                   | .0015 | .0023 | .0029 | .0034 | .0039 | .0045 |
|                | 4 | 0.75 x D                                                                          | 0.5 x D                                                                           | 0.5 x D                                                                            | 300   | –    | 490   | IPT                                                                                                   | .0014 | .0020 | .0026 | .0030 | .0034 | .0039 |
|                | 5 | 0.75 x D                                                                          | 0.5 x D                                                                           | 0.75 x D                                                                           | 200   | –    | 330   | IPT                                                                                                   | .0012 | .0018 | .0023 | .0027 | .0031 | .0036 |
|                | 6 | 0.75 x D                                                                          | 0.5 x D                                                                           | 0.5 x D                                                                            | 160   | –    | 250   | IPT                                                                                                   | .0010 | .0015 | .0019 | .0022 | .0025 | .0028 |
| M              | 1 | 0.75 x D                                                                          | 0.5 x D                                                                           | 0.75 x D                                                                           | 300   | –    | 380   | IPT                                                                                                   | .0015 | .0023 | .0029 | .0034 | .0039 | .0045 |
|                | 2 | 0.75 x D                                                                          | 0.5 x D                                                                           | 0.75 x D                                                                           | 200   | –    | 260   | IPT                                                                                                   | .0012 | .0018 | .0023 | .0027 | .0031 | .0036 |
|                | 3 | 0.75 x D                                                                          | 0.5 x D                                                                           | 0.75 x D                                                                           | 200   | –    | 230   | IPT                                                                                                   | .0010 | .0015 | .0019 | .0022 | .0025 | .0028 |
| K              | 1 | 0.75 x D                                                                          | 0.5 x D                                                                           | 0.75 x D                                                                           | 390   | –    | 490   | IPT                                                                                                   | .0018 | .0027 | .0034 | .0039 | .0044 | .0049 |
|                | 2 | 0.75 x D                                                                          | 0.5 x D                                                                           | 0.75 x D                                                                           | 360   | –    | 460   | IPT                                                                                                   | .0015 | .0023 | .0029 | .0034 | .0039 | .0045 |
|                | 3 | 0.75 x D                                                                          | 0.5 x D                                                                           | 0.75 x D                                                                           | 360   | –    | 430   | IPT                                                                                                   | .0012 | .0018 | .0023 | .0027 | .0031 | .0036 |
| S              | 1 | 0.75 x D                                                                          | 0.3 x D                                                                           | 0.3 x D                                                                            | 160   | –    | 300   | IPT                                                                                                   | .0015 | .0023 | .0029 | .0034 | .0039 | .0045 |
|                | 2 | 0.75 x D                                                                          | 0.3 x D                                                                           | 0.3 x D                                                                            | 80    | –    | 130   | IPT                                                                                                   | .0008 | .0012 | .0015 | .0018 | .0021 | .0024 |
|                | 3 | 0.75 x D                                                                          | 0.5 x D                                                                           | 0.75 x D                                                                           | 200   | –    | 260   | IPT                                                                                                   | .0012 | .0018 | .0023 | .0027 | .0031 | .0036 |
|                | 4 | 0.75 x D                                                                          | 0.5 x D                                                                           | 0.75 x D                                                                           | 160   | –    | 200   | IPT                                                                                                   | .0011 | .0017 | .0021 | .0025 | .0028 | .0033 |
| H              | 1 | 0.75 x D                                                                          | 0.5 x D                                                                           | 0.5 x D                                                                            | 260   | –    | 460   | IPT                                                                                                   | .0014 | .0020 | .0026 | .0030 | .0034 | .0039 |

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 1/2".

Side milling applications — for longest reach (L3) tools, reduce ae by 30%.

Slot milling applications — for longest reach (L3) tools, reduce ae by 30%.

**■ Series 4V00 • VariMill I • Victory Grades**


| Material Group |   |                                   |         |          |                        |     |      |                                                                                                          |       |       |       |       |       |       |       |       |       |       |       |  |
|----------------|---|-----------------------------------|---------|----------|------------------------|-----|------|----------------------------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
|                |   | Side Milling (A) and Slotting (B) |         |          | WP15PE                 |     |      | Recommended feed per tooth (IPT = inch/th) for side milling (A).<br>For slotting (B), reduce IPT by 20%. |       |       |       |       |       |       |       |       |       |       |       |  |
|                |   | A                                 |         | B        | Cutting Speed — vc SFM |     |      | D1 — Diameter                                                                                            |       |       |       |       |       |       |       |       |       |       |       |  |
|                |   | ap                                | ae      | ap       | min                    | max | dec. | frac.                                                                                                    | 1/8   | 3/16  | 1/4   | 5/16  | 3/8   | 7/16  | 1/2   | 5/8   | 3/4   | 1     | 1-1/4 |  |
| P              | 0 | 1.25 x D                          | 0.5 x D | 1 x D    | 490                    | –   | 660  | IPT                                                                                                      | .0009 | .0013 | .0018 | .0023 | .0027 | .0031 | .0034 | .0039 | .0044 | .0049 | .0049 |  |
|                | 1 | 1.25 x D                          | 0.5 x D | 1 x D    | 490                    | –   | 660  | IPT                                                                                                      | .0009 | .0013 | .0018 | .0023 | .0027 | .0031 | .0034 | .0039 | .0044 | .0049 | .0049 |  |
|                | 2 | 1.25 x D                          | 0.5 x D | 1 x D    | 460                    | –   | 620  | IPT                                                                                                      | .0009 | .0013 | .0018 | .0023 | .0027 | .0031 | .0034 | .0039 | .0044 | .0049 | .0049 |  |
|                | 3 | 1.25 x D                          | 0.5 x D | 1 x D    | 390                    | –   | 520  | IPT                                                                                                      | .0007 | .0011 | .0015 | .0020 | .0023 | .0026 | .0029 | .0034 | .0039 | .0045 | .0048 |  |
|                | 4 | 1.25 x D                          | 0.5 x D | 0.75 x D | 300                    | –   | 490  | IPT                                                                                                      | .0007 | .0010 | .0014 | .0017 | .0020 | .0023 | .0026 | .0030 | .0034 | .0039 | .0040 |  |
|                | 5 | 1.25 x D                          | 0.5 x D | 1 x D    | 200                    | –   | 330  | IPT                                                                                                      | .0006 | .0009 | .0012 | .0016 | .0018 | .0021 | .0023 | .0027 | .0031 | .0036 | .0039 |  |
| M              | 6 | 1.25 x D                          | 0.5 x D | 0.75 x D | 160                    | –   | 250  | IPT                                                                                                      | .0005 | .0008 | .0010 | .0013 | .0015 | .0017 | .0019 | .0022 | .0025 | .0028 | .0029 |  |
|                | 1 | 1.25 x D                          | 0.5 x D | 1 x D    | 300                    | –   | 380  | IPT                                                                                                      | .0007 | .0011 | .0015 | .0020 | .0023 | .0026 | .0029 | .0034 | .0039 | .0045 | .0048 |  |
|                | 2 | 1.25 x D                          | 0.5 x D | 1 x D    | 200                    | –   | 260  | IPT                                                                                                      | .0006 | .0009 | .0012 | .0016 | .0018 | .0021 | .0023 | .0027 | .0031 | .0036 | .0039 |  |
| K              | 3 | 1.25 x D                          | 0.5 x D | 1 x D    | 200                    | –   | 230  | IPT                                                                                                      | .0005 | .0008 | .0010 | .0013 | .0015 | .0017 | .0019 | .0022 | .0025 | .0028 | .0029 |  |
|                | 1 | 1.25 x D                          | 0.5 x D | 1 x D    | 390                    | –   | 490  | IPT                                                                                                      | .0009 | .0013 | .0018 | .0023 | .0027 | .0031 | .0034 | .0039 | .0044 | .0049 | .0049 |  |
|                | 2 | 1.25 x D                          | 0.5 x D | 1 x D    | 360                    | –   | 460  | IPT                                                                                                      | .0007 | .0011 | .0015 | .0020 | .0023 | .0026 | .0029 | .0034 | .0039 | .0045 | .0048 |  |
| S              | 3 | 1.25 x D                          | 0.5 x D | 1 x D    | 360                    | –   | 430  | IPT                                                                                                      | .0006 | .0009 | .0012 | .0016 | .0018 | .0021 | .0023 | .0027 | .0031 | .0036 | .0039 |  |
|                | 1 | 1 x D                             | 0.3 x D | 0.3 x D  | 160                    | –   | 300  | IPT                                                                                                      | .0007 | .0011 | .0015 | .0020 | .0023 | .0026 | .0029 | .0034 | .0039 | .0045 | .0048 |  |
|                | 2 | 1 x D                             | 0.3 x D | 0.3 x D  | 80                     | –   | 130  | IPT                                                                                                      | .0004 | .0006 | .0008 | .0010 | .0012 | .0014 | .0015 | .0018 | .0021 | .0024 | .0026 |  |
|                | 3 | 1.25 x D                          | 0.5 x D | 1 x D    | 200                    | –   | 260  | IPT                                                                                                      | .0006 | .0009 | .0012 | .0016 | .0018 | .0021 | .0023 | .0027 | .0031 | .0036 | .0039 |  |
| H              | 4 | 1.25 x D                          | 0.5 x D | 1 x D    | 160                    | –   | 200  | IPT                                                                                                      | .0005 | .0008 | .0011 | .0014 | .0017 | .0019 | .0021 | .0025 | .0028 | .0033 | .0036 |  |
|                | 1 | 1.25 x D                          | 0.5 x D | 0.75 x D | 260                    | –   | 460  | IPT                                                                                                      | .0007 | .0010 | .0014 | .0017 | .0020 | .0023 | .0026 | .0030 | .0034 | .0039 | .0040 |  |
|                | 2 | 1.25 x D                          | 0.2 x D | 0.5 x D  | 230                    | –   | 390  | IPT                                                                                                      | .0005 | .0008 | .0010 | .0013 | .0015 | .0017 | .0019 | .0022 | .0025 | .0028 | .0029 |  |

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.  
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.  
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

High-Performance Solid Carbide End Mills •

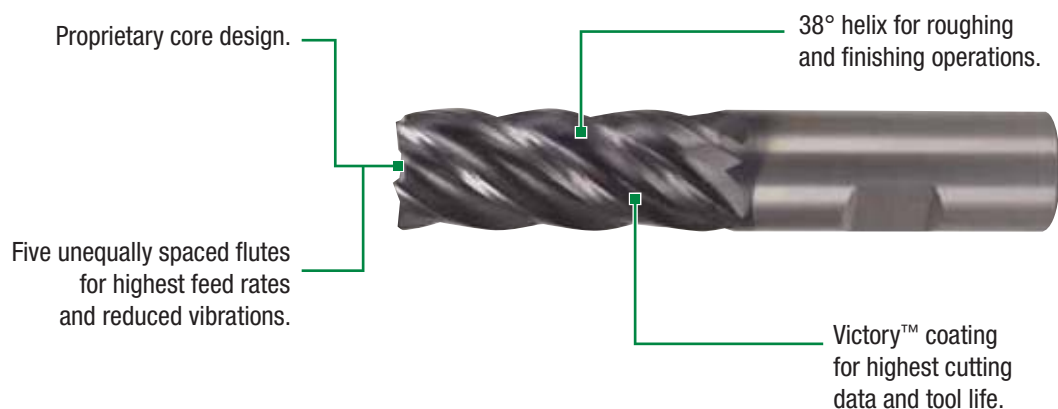
**VariMill II™**

# VariMill II



VariMill II end mills are the proven leader in the field of high-performance, chatter-free machining. They are designed to provide maximum metal removal rates and to achieve supreme surface conditions. Utilizing an innovative and proprietary design with unequal flute spacing, VariMill II carbide end mills provide users with the most versatile technology available, capable of outperforming other high-performance tools.

- 1 x D slotting in titanium and stainless steels with five unequally spaced flutes.
- Roughing and finishing with one tool.
- Various lengths-of-cut; necked and corner radius versions available.



**WIDIA**  
**VICTORY**

### VariMill II™ Series

- Five unequally spaced flutes boosting your output with higher feed rates.
- Center cutting.
- Roughing and finishing with one tool.
- Less passes due to 1 x D slotting capability on almost all materials, including titanium.
- Ramping up to 3°.

### 5VOC Series

- Highest metal removal rates and tool life in:
  - Stainless steels, steels, and alloyed steels.
  - Cast iron.
  - High temperature alloys and titanium.
- Corner radii and sharp edges.

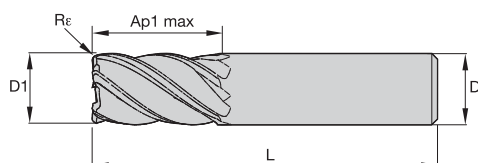
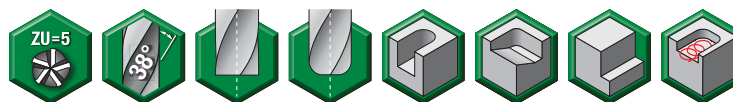


### 5VNC Series

- Steels, stainless steels, and high temperature alloys.
- Radii corner and neck design for depths requiring additional passes.



- Unequal flute spacing.
- Center cutting.
- Single tool for both roughing and finishing operations requiring fewer setups.
- Slotting up to 1 x D.
- Standard items listed. Additional styles and coatings made to order.

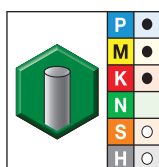


End Mill Tolerances

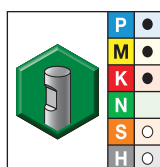
| D1  | tolerance     | D               | tolerance h6<br>+ / - |
|-----|---------------|-----------------|-----------------------|
| All | + .000/- .002 | ≤ 1/8"          | 0/.00024              |
|     |               | > 1/8-1/4"      | 0/.00031              |
|     |               | > 1/4-3/8"      | 0/.00035              |
|     |               | > 3/8-23/32"    | 0/.00043              |
|     |               | > 23/32-1 3/16" | 0/.00051              |



### Series 5V0C • VariMill II • Victory Grades



grade WP15PE  
AITiN



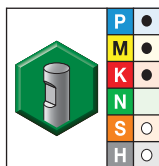
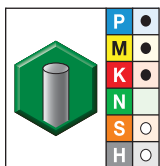
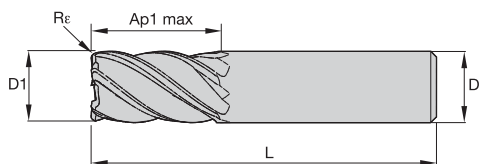
grade WP15PE  
AITiN

- first choice
- alternate choice

| order # | catalog #   | order # | catalog #   | D1   | D    | length of cut<br>Ap1 max | length<br>L | Re   |
|---------|-------------|---------|-------------|------|------|--------------------------|-------------|------|
| 5577051 | 5V0C05000AT | -       | -           | 3/16 | 3/16 | 5/8                      | 2 1/4       | .015 |
| 5577052 | 5V0C05000BT | -       | -           | 3/16 | 3/16 | 5/8                      | 2 1/4       | .030 |
| 5577053 | 5V0C05000ST | -       | -           | 3/16 | 3/16 | 5/8                      | 2 1/4       | -    |
| 5577054 | 5V0C07002AT | -       | -           | 1/4  | 1/4  | 3/4                      | 2 1/2       | .015 |
| 5577055 | 5V0C07002BT | -       | -           | 1/4  | 1/4  | 3/4                      | 2 1/2       | .030 |
| 5577056 | 5V0C07002CT | -       | -           | 1/4  | 1/4  | 3/4                      | 2 1/2       | .060 |
| 5577057 | 5V0C07002ST | -       | -           | 1/4  | 1/4  | 3/4                      | 2 1/2       | -    |
| 5577058 | 5V0C08003AT | -       | -           | 5/16 | 5/16 | 3/4                      | 2 1/2       | .015 |
| 5577059 | 5V0C08003BT | -       | -           | 5/16 | 5/16 | 3/4                      | 2 1/2       | .030 |
| 5577100 | 5V0C08003CT | -       | -           | 5/16 | 5/16 | 3/4                      | 2 1/2       | .060 |
| 5577101 | 5V0C08003ST | -       | -           | 5/16 | 5/16 | 3/4                      | 2 1/2       | -    |
| 5577102 | 5V0C10004AT | -       | -           | 3/8  | 3/8  | 7/8                      | 2 1/2       | .015 |
| 5577103 | 5V0C10004BT | -       | -           | 3/8  | 3/8  | 7/8                      | 2 1/2       | .030 |
| 5577104 | 5V0C10004CT | -       | -           | 3/8  | 3/8  | 7/8                      | 2 1/2       | .060 |
| 5577105 | 5V0C10004ST | -       | -           | 3/8  | 3/8  | 7/8                      | 2 1/2       | -    |
| 5577106 | 5V0C13015AT | 5577107 | 5V0C13015AW | 1/2  | 1/2  | 1 1/4                    | 3           | .015 |
| 5577108 | 5V0C13015BT | 5577109 | 5V0C13015BW | 1/2  | 1/2  | 1 1/4                    | 3           | .030 |
| 5577110 | 5V0C13015CT | 5577111 | 5V0C13015CW | 1/2  | 1/2  | 1 1/4                    | 3           | .060 |
| 5577112 | 5V0C13015DT | 5577113 | 5V0C13015DW | 1/2  | 1/2  | 1 1/4                    | 3           | .090 |
| 5577114 | 5V0C13015ET | 5577115 | 5V0C13015EW | 1/2  | 1/2  | 1 1/4                    | 3           | .120 |

(continued)

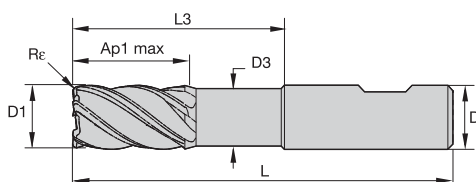
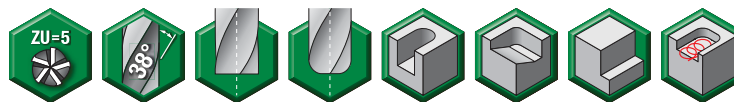
(Series 5V0C • VariMill II • Victory Grades — continued)



● first choice  
○ alternate choice

| grade WP15PE<br>AITiN |             | grade WP15PE<br>AITiN |             | D1  | D   | length of cut<br>Ap1 max | length<br>L | Re   |
|-----------------------|-------------|-----------------------|-------------|-----|-----|--------------------------|-------------|------|
| order #               | catalog #   | order #               | catalog #   |     |     |                          |             |      |
| 5577116               | 5V0C13015ST | 5577117               | 5V0C13015SW | 1/2 | 1/2 | 1 1/4                    | 3           | —    |
| 5577118               | 5V0C16006BT | 5577119               | 5V0C16006BW | 5/8 | 5/8 | 1 1/4                    | 3 1/2       | .030 |
| 5577130               | 5V0C16006CT | 5577131               | 5V0C16006CW | 5/8 | 5/8 | 1 1/4                    | 3 1/2       | .060 |
| 5577132               | 5V0C16006DT | 5577133               | 5V0C16006DW | 5/8 | 5/8 | 1 1/4                    | 3 1/2       | .090 |
| 5577134               | 5V0C16006ST | 5577135               | 5V0C16006SW | 5/8 | 5/8 | 1 1/4                    | 3 1/2       | —    |
| 5577136               | 5V0C19007BT | 5577137               | 5V0C19007BW | 3/4 | 3/4 | 1 1/2                    | 4           | .030 |
| 5577138               | 5V0C19007CT | 5577139               | 5V0C19007CW | 3/4 | 3/4 | 1 1/2                    | 4           | .060 |
| 5577160               | 5V0C19007DT | 5577161               | 5V0C19007DW | 3/4 | 3/4 | 1 1/2                    | 4           | .090 |
| 5577162               | 5V0C19007ET | 5577163               | 5V0C19007EW | 3/4 | 3/4 | 1 1/2                    | 4           | .120 |
| 5577164               | 5V0C19007ST | 5577165               | 5V0C19007SW | 3/4 | 3/4 | 1 1/2                    | 4           | —    |
| 5577166               | 5V0C25008BT | 5577167               | 5V0C25008BW | 1   | 1   | 1 3/4                    | 4 1/2       | .030 |
| 5577168               | 5V0C25008CT | 5577169               | 5V0C25008CW | 1   | 1   | 1 3/4                    | 4 1/2       | .060 |
| 5577180               | 5V0C25008DT | 5577181               | 5V0C25008DW | 1   | 1   | 1 3/4                    | 4 1/2       | .090 |
| 5577182               | 5V0C25008ET | 5577183               | 5V0C25008EW | 1   | 1   | 1 3/4                    | 4 1/2       | .120 |
| 5577184               | 5V0C25008ST | 5577185               | 5V0C25008SW | 1   | 1   | 1 3/4                    | 4 1/2       | —    |

- Unequal flute spacing.
- Center cutting.
- Single tool for both roughing and finishing operations requiring fewer setups.
- Slotting up to 1 x D.
- Standard items listed. Additional styles and coatings made to order.

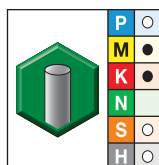


End Mill Tolerances

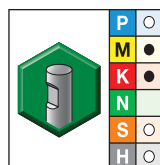
| D1  | tolerance    | D               | tolerance h6<br>+ / - |
|-----|--------------|-----------------|-----------------------|
| All | +.000/- .002 | ≤ 1/8"          | 0/.00024              |
|     |              | > 1/8-1/4"      | 0/.00031              |
|     |              | > 1/4-3/8"      | 0/.00035              |
|     |              | > 3/8-23/32"    | 0/.00043              |
|     |              | > 23/32-1 3/16" | 0/.00051              |



### Series 5VNC • VariMill II • With Neck • Victory Grades



grade WP15PE  
AITiN



grade WP15PE  
AITiN

- first choice
- alternate choice

| order # | catalog #   | order # | catalog #   | D1  | D   | D3  | length of cut<br>Ap1 max | L3    | length<br>L | Re   |
|---------|-------------|---------|-------------|-----|-----|-----|--------------------------|-------|-------------|------|
| 5594727 | 5VNC07012AT | —       | —           | 1/4 | 1/4 | .24 | 1/2                      | 1.250 | 4           | .015 |
| 5594728 | 5VNC10014AT | —       | —           | 3/8 | 3/8 | .35 | 7/8                      | 1.875 | 4           | .015 |
| 5594729 | 5VNC13005BT | 5594850 | 5VNC13005BW | 1/2 | 1/2 | .47 | 1 1/4                    | 2.250 | 4           | .030 |
| 5594851 | 5VNC16006BT | 5594852 | 5VNC16006BW | 5/8 | 5/8 | .59 | 1 1/4                    | 2.250 | 4           | .030 |
| 5594853 | 5VNC19017BT | 5594854 | 5VNC19017BW | 3/4 | 3/4 | .71 | 1 1/2                    | 3.250 | 5.5         | .030 |
| 5594855 | 5VNC25018BT | 5594856 | 5VNC25018BW | 1   | 1   | .94 | 1 3/4                    | 3.250 | 5.5         | .030 |

**Series 5V0C • VariMill II • Victory Grades**


| Material Group |   |                                   |         |          |                        |   |     |                                                                                                       |               |       |       |       |       |       |       |       |  |
|----------------|---|-----------------------------------|---------|----------|------------------------|---|-----|-------------------------------------------------------------------------------------------------------|---------------|-------|-------|-------|-------|-------|-------|-------|--|
|                |   | Side Milling (A) and Slotting (B) |         |          | WP15PE                 |   |     | Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%. |               |       |       |       |       |       |       |       |  |
|                |   | A                                 |         | B        | Cutting Speed — vc SFM |   |     | frac.                                                                                                 | D1 — Diameter |       |       |       |       |       |       |       |  |
|                |   | ap                                | ae      | ap       | min                    |   | max |                                                                                                       | 3/16          | 1/4   | 5/16  | 3/8   | 1/2   | 5/8   | 3/4   | 1     |  |
| P              | 0 | 1.5 x D                           | 0.5 x D | 1 x D    | 490                    | – | 660 | IPT                                                                                                   | .0014         | .0018 | .0023 | .0027 | .0034 | .0040 | .0044 | .0049 |  |
|                | 1 | 1.5 x D                           | 0.5 x D | 1 x D    | 490                    | – | 660 | IPT                                                                                                   | .0014         | .0018 | .0023 | .0027 | .0034 | .0040 | .0044 | .0049 |  |
|                | 2 | 1.5 x D                           | 0.5 x D | 1 x D    | 460                    | – | 620 | IPT                                                                                                   | .0014         | .0018 | .0023 | .0027 | .0034 | .0040 | .0044 | .0049 |  |
|                | 3 | 1.5 x D                           | 0.5 x D | 1 x D    | 390                    | – | 520 | IPT                                                                                                   | .0011         | .0015 | .0020 | .0023 | .0029 | .0034 | .0039 | .0045 |  |
|                | 4 | 1.5 x D                           | 0.5 x D | 0.75 x D | 300                    | – | 490 | IPT                                                                                                   | .0010         | .0014 | .0018 | .0020 | .0026 | .0030 | .0034 | .0039 |  |
| M              | 5 | 1.5 x D                           | 0.5 x D | 1 x D    | 200                    | – | 330 | IPT                                                                                                   | .0009         | .0012 | .0016 | .0018 | .0023 | .0027 | .0031 | .0036 |  |
|                | 1 | 1.5 x D                           | 0.5 x D | 1 x D    | 300                    | – | 380 | IPT                                                                                                   | .0011         | .0015 | .0020 | .0023 | .0029 | .0034 | .0039 | .0045 |  |
|                | 2 | 1.5 x D                           | 0.5 x D | 1 x D    | 200                    | – | 260 | IPT                                                                                                   | .0009         | .0012 | .0016 | .0018 | .0023 | .0027 | .0031 | .0036 |  |
| K              | 3 | 1.5 x D                           | 0.5 x D | 1 x D    | 200                    | – | 230 | IPT                                                                                                   | .0008         | .0010 | .0013 | .0015 | .0019 | .0022 | .0025 | .0028 |  |
|                | 1 | 1.5 x D                           | 0.5 x D | 1 x D    | 390                    | – | 490 | IPT                                                                                                   | .0014         | .0018 | .0023 | .0027 | .0034 | .0040 | .0044 | .0049 |  |
|                | 2 | 1.5 x D                           | 0.5 x D | 1 x D    | 360                    | – | 460 | IPT                                                                                                   | .0011         | .0015 | .0020 | .0023 | .0029 | .0034 | .0039 | .0045 |  |
| S              | 3 | 1.5 x D                           | 0.5 x D | 1 x D    | 360                    | – | 430 | IPT                                                                                                   | .0009         | .0012 | .0016 | .0018 | .0023 | .0027 | .0031 | .0036 |  |
|                | 1 | 1.5 x D                           | 0.3 x D | 0.3 x D  | 160                    | – | 300 | IPT                                                                                                   | .0011         | .0015 | .0020 | .0023 | .0029 | .0034 | .0039 | .0045 |  |
|                | 2 | 1.5 x D                           | 0.3 x D | 0.3 x D  | 80                     | – | 130 | IPT                                                                                                   | .0006         | .0008 | .0010 | .0012 | .0015 | .0018 | .0021 | .0024 |  |
|                | 3 | 1.5 x D                           | 0.3 x D | 0.3 x D  | 200                    | – | 260 | IPT                                                                                                   | .0009         | .0012 | .0016 | .0018 | .0023 | .0027 | .0031 | .0036 |  |
| H              | 4 | 1.5 x D                           | 0.5 x D | 1 x D    | 160                    | – | 200 | IPT                                                                                                   | .0008         | .0011 | .0014 | .0017 | .0021 | .0025 | .0028 | .0033 |  |
|                | 1 | 1.5 x D                           | 0.5 x D | 0.75 x D | 260                    | – | 460 | IPT                                                                                                   | .0010         | .0014 | .0018 | .0020 | .0026 | .0030 | .0034 | .0039 |  |
|                | 2 | 1.5 x D                           | 0.2 x D | 0.5 x D  | 230                    | – | 390 | IPT                                                                                                   | .0008         | .0010 | .0013 | .0015 | .0019 | .0022 | .0025 | .0028 |  |

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.  
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.  
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

### ■ Series 5VNC • VariMill II • With Neck • Victory Grades



| Material Group |   |                                   |         |          |                        |   |                                                                                                       |               |       |       |       |       |       |       |       |
|----------------|---|-----------------------------------|---------|----------|------------------------|---|-------------------------------------------------------------------------------------------------------|---------------|-------|-------|-------|-------|-------|-------|-------|
|                |   | Side Milling (A) and Slotting (B) |         | WP15PE   |                        |   | Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%. |               |       |       |       |       |       |       |       |
|                |   | A                                 |         | B        | Cutting Speed — vc SFM |   |                                                                                                       | D1 — Diameter |       |       |       |       |       |       |       |
|                |   | ap                                | ae      | ap       | min                    |   | max                                                                                                   | frac.         | 1/4   | 5/16  | 3/8   | 1/2   | 5/8   | 3/4   | 1     |
| P              | 5 | 1.5 x D                           | 0.5 x D | 1 x D    | 200                    | – | 330                                                                                                   | IPT           | .0012 | .0016 | .0018 | .0023 | .0027 | .0031 | .0036 |
|                | 6 | 1.5 x D                           | 0.5 x D | 0.75 x D | 160                    | – | 250                                                                                                   | IPT           | .0010 | .0013 | .0015 | .0019 | .0022 | .0025 | .0028 |
| M              | 1 | 1.5 x D                           | 0.5 x D | 1 x D    | 300                    | – | 380                                                                                                   | IPT           | .0015 | .0020 | .0023 | .0029 | .0034 | .0039 | .0045 |
|                | 2 | 1.5 x D                           | 0.5 x D | 1 x D    | 200                    | – | 260                                                                                                   | IPT           | .0012 | .0016 | .0018 | .0023 | .0027 | .0031 | .0036 |
|                | 3 | 1.5 x D                           | 0.5 x D | 1 x D    | 200                    | – | 230                                                                                                   | IPT           | .0010 | .0013 | .0015 | .0019 | .0022 | .0025 | .0028 |
| K              | 1 | 1.5 x D                           | 0.5 x D | 1 x D    | 390                    | – | 490                                                                                                   | IPT           | .0018 | .0023 | .0027 | .0034 | .0040 | .0044 | .0049 |
|                | 2 | 1.5 x D                           | 0.5 x D | 1 x D    | 360                    | – | 460                                                                                                   | IPT           | .0015 | .0020 | .0023 | .0029 | .0034 | .0039 | .0045 |
|                | 3 | 1.5 x D                           | 0.5 x D | 1 x D    | 360                    | – | 430                                                                                                   | IPT           | .0012 | .0016 | .0018 | .0023 | .0027 | .0031 | .0036 |
| S              | 1 | 1.5 x D                           | 0.3 x D | 0.3 x D  | 160                    | – | 300                                                                                                   | IPT           | .0015 | .0020 | .0023 | .0029 | .0034 | .0039 | .0045 |
|                | 2 | 1.5 x D                           | 0.3 x D | 0.3 x D  | 80                     | – | 130                                                                                                   | IPT           | .0008 | .0010 | .0012 | .0015 | .0018 | .0021 | .0024 |
|                | 3 | 1.5 x D                           | 0.3 x D | 0.3 x D  | 200                    | – | 260                                                                                                   | IPT           | .0012 | .0016 | .0018 | .0023 | .0027 | .0031 | .0036 |
|                | 4 | 1.5 x D                           | 0.5 x D | 1 x D    | 160                    | – | 200                                                                                                   | IPT           | .0011 | .0014 | .0017 | .0021 | .0025 | .0028 | .0033 |
| H              | 1 | 1.5 x D                           | 0.5 x D | 0.75 x D | 260                    | – | 460                                                                                                   | IPT           | .0014 | .0018 | .0020 | .0026 | .0030 | .0034 | .0039 |
|                | 2 | 1.5 x D                           | 0.2 x D | 0.5 x D  | 230                    | – | 390                                                                                                   | IPT           | .0010 | .0013 | .0015 | .0019 | .0022 | .0025 | .0028 |

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.  
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.  
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

# HydroForce<sup>TM</sup> HT Chuck



EXTREME **CHALLENGES.**  
EXTREME **RESULTS.**

HydroForce<sup>TM</sup> HT Chuck High Torque for High Metal Removal Rates (MRR) and Superior Surface Finish

- HydroForce gives you an unmatched combination of accuracy and clamping forces.
- Compact and stable design.
- Advanced hydraulic clamping with lowest runout and superior vibration dampening.
- Balanced quality to lower vibration, especially at high speeds.
- Focused and flexible product offering.

To learn more about our innovations, contact your local Authorized Distributor or visit [widia.com](http://widia.com).

**WIDIA** 

High-Performance Solid Carbide End Mills •

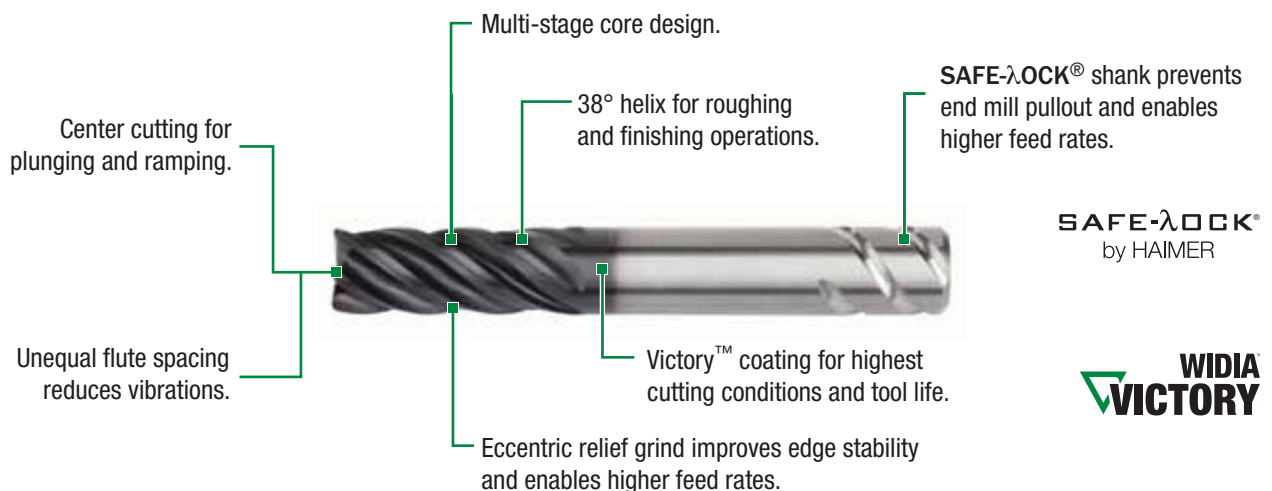
**VariMill II™ ER**

# VariMill II ER



Engineered with Eccentric Relief (ER) grind at the cutting edges for greater edge strength, enabling higher metal removal rates and increased productivity. The new VariMill II ER is the first WIDIA™ off-the-shelf end mill available with **SAFE-λOCK®** by HAIMER, providing excellent stability, eliminating end mill pullout, and increasing concentric tool clamping. Though primarily designed for roughing and finishing applications in the aerospace industry, VariMill II ER can be used as a solution for any titanium or stainless steel application and is capable of slotting, ramping, and plunging.

- High-performance tools for titanium and stainless steel workpiece materials.
- Roughing and finishing with one tool, lowering tool costs.
- Various radius and necked versions available.
- Standard offering with **SAFE-λOCK®** by HAIMER.



### VariMill II™ ER Series

- Unique geometry providing increased tool life and higher metal removal rates in difficult-to-machine workpiece materials.
- Increased output due to fewer tool changes and higher metal removal rates.
- Roughing and finishing with one tool, lowering tool costs.
- 1 x D slotting capability requires less passes, increasing productivity.

#### 5V0E Series

- Eccentric relief for edge stability and strength.
- Extensive radii corner offering.



#### 5VNE Series

- Eccentric relief for edge stability and strength.
- Extensive radii corner offering.
- Neck design for depths requiring additional passes.



#### Application Example

Side milling of INCONEL® 718 component.

Workpiece material: INCONEL 718

Tool: D = 5/8"

Cutting data: ap = 1.08"

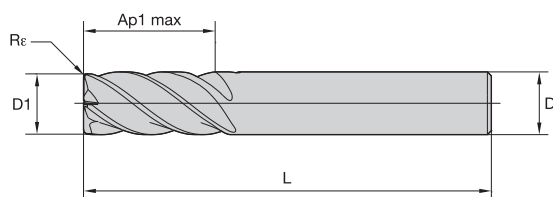
ae = .05"

vc = 65 SFM

fz = .0019 in/z

Result: Increased tool life from 2 years to 5.

- Unequal flute spacing.
- Center cutting.
- Optimized geometry for titanium and stainless steel.
- Single tool for both roughing and finishing operations requiring fewer setups.
- Standard items listed. Additional styles and coatings made to order.

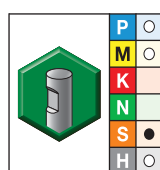
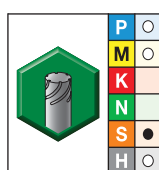
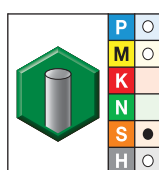


End Mill Tolerances

| D1  | tolerance    | D               | tolerance h6 + / - |
|-----|--------------|-----------------|--------------------|
| All | +.000/- .002 | ≤ 1/8"          | 0/.00024           |
|     |              | > 1/8-1/4"      | 0/.00031           |
|     |              | > 1/4-3/8"      | 0/.00035           |
|     |              | > 3/8-23/32"    | 0/.00043           |
|     |              | > 23/32-1 3/16" | 0/.00051           |



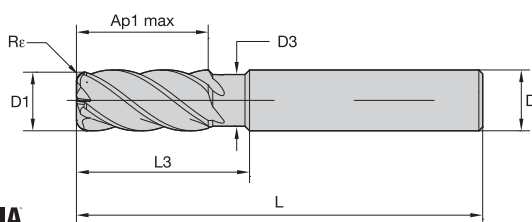
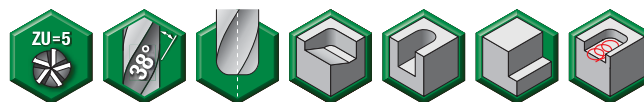
### Series 5V0E • VariMill II ER • Victory Grades



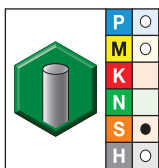
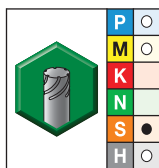
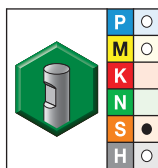
- first choice
- alternate choice

| grade WS15PE<br>AlTiN |             | grade WS15PE<br>AlTiN |             | grade WS15PE<br>AlTiN |             |     |     |                          |             |      |
|-----------------------|-------------|-----------------------|-------------|-----------------------|-------------|-----|-----|--------------------------|-------------|------|
| order #               | catalog #   | order #               | catalog #   | order #               | catalog #   | D1  | D   | length of cut<br>Ap1 max | length<br>L | Rε   |
| 5594857               | 5V0E10004AT | -                     |             | -                     |             | 3/8 | 3/8 | 7/8                      | 2 1/2       | .015 |
| 5594858               | 5V0E10004BT | -                     |             | -                     |             | 3/8 | 3/8 | 7/8                      | 2 1/2       | .030 |
| 5594859               | 5V0E10004ST | -                     |             | -                     |             | 3/8 | 3/8 | 7/8                      | 2 1/2       | —    |
| -                     |             | 5594860               | 5V0E13015AV | 5594861               | 5V0E13015AW | 1/2 | 1/2 | 1 1/4                    | 3           | .015 |
| -                     |             | 5594862               | 5V0E13015BV | 5594863               | 5V0E13015BW | 1/2 | 1/2 | 1 1/4                    | 3           | .030 |
| -                     |             | 5594864               | 5V0E13015CV | 5594865               | 5V0E13015CW | 1/2 | 1/2 | 1 1/4                    | 3           | .060 |
| -                     |             | 5594866               | 5V0E13015DV | 5594867               | 5V0E13015DW | 1/2 | 1/2 | 1 1/4                    | 3           | .090 |
| -                     |             | 5594868               | 5V0E13015EV | 5594869               | 5V0E13015EW | 1/2 | 1/2 | 1 1/4                    | 3           | .120 |
| -                     |             | 5594870               | 5V0E13015SV | 5594871               | 5V0E13015SW | 1/2 | 1/2 | 1 1/4                    | 3           | —    |
| -                     |             | 5594872               | 5V0E16006BV | 5594873               | 5V0E16006BW | 5/8 | 5/8 | 1 1/4                    | 3 1/2       | .030 |
| -                     |             | 5594874               | 5V0E16006CV | 5594875               | 5V0E16006CW | 5/8 | 5/8 | 1 1/4                    | 3 1/2       | .060 |
| -                     |             | 5594876               | 5V0E16006SV | 5594877               | 5V0E16006SW | 5/8 | 5/8 | 1 1/4                    | 3 1/2       | —    |
| -                     |             | 5594878               | 5V0E19007BV | 5594879               | 5V0E19007BW | 3/4 | 3/4 | 1 1/2                    | 4           | .030 |
| -                     |             | 5594880               | 5V0E19007CV | 5594881               | 5V0E19007CW | 3/4 | 3/4 | 1 1/2                    | 4           | .060 |
| -                     |             | 5594882               | 5V0E19007DV | 5594883               | 5V0E19007DW | 3/4 | 3/4 | 1 1/2                    | 4           | .090 |
| -                     |             | 5594884               | 5V0E19007EV | 5594885               | 5V0E19007EW | 3/4 | 3/4 | 1 1/2                    | 4           | .120 |
| -                     |             | 5594886               | 5V0E19007SV | 5594887               | 5V0E19007SW | 3/4 | 3/4 | 1 1/2                    | 4           | —    |
| -                     |             | 5594888               | 5V0E25008BV | 5594889               | 5V0E25008BW | 1   | 1   | 1 3/4                    | 4 1/2       | .030 |
| -                     |             | 5594890               | 5V0E25008CV | 5594891               | 5V0E25008CW | 1   | 1   | 1 3/4                    | 4 1/2       | .060 |
| -                     |             | 5594892               | 5V0E25008EV | 5594893               | 5V0E25008EW | 1   | 1   | 1 3/4                    | 4 1/2       | .120 |
| -                     |             | 5594894               | 5V0E25008FV | 5594895               | 5V0E25008FW | 1   | 1   | 1 3/4                    | 4 1/2       | .250 |
| -                     |             | 5594896               | 5V0E25008SV | 5594897               | 5V0E25008SW | 1   | 1   | 1 3/4                    | 4 1/2       | —    |

- Unequal flute spacing.
- Center cutting.
- Optimized geometry for titanium and stainless steel.
- Single tool for both roughing and finishing operations requiring fewer setups.
- Standard items listed. Additional styles and coatings made to order.


**WIDIA**  
**VICTORY**
**End Mill Tolerances**

| D1  | tolerance    | D               | tolerance h6 + / - |
|-----|--------------|-----------------|--------------------|
| All | +.000/- .002 | ≤ 1/8"          | 0/.00024           |
|     |              | > 1/8-1/4"      | 0/.00031           |
|     |              | > 1/4-3/8"      | 0/.00035           |
|     |              | > 3/8-23/32"    | 0/.00043           |
|     |              | > 23/32-1 3/16" | 0/.00051           |

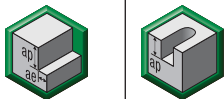
**■ Series 5VNE • VariMill II ER • With Neck • Victory Grades**

**grade WS15PE**  
**AITiN**

**grade WS15PE**  
**AITiN**

**grade WS15PE**  
**AITiN**

- first choice
- alternate choice

| order # | catalog #   | order # | catalog #   | order # | catalog #   | D1  | D   | D3  | length of cut<br>Ap1 max | L3    | length<br>L | Re   |
|---------|-------------|---------|-------------|---------|-------------|-----|-----|-----|--------------------------|-------|-------------|------|
| 5594898 | 5VNE10014AT | —       | —           | 5594900 | 5VNE13005BW | 3/8 | 3/8 | .35 | 7/8                      | 1.875 | 4           | .015 |
| —       | —           | 5594899 | 5VNE13005BV | 5594902 | 5VNE16006BW | 1/2 | 1/2 | .47 | 1 1/4                    | 2.250 | 4           | .030 |
| —       | —           | 5594901 | 5VNE16006BV | 5594904 | 5VNE19017BW | 5/8 | 5/8 | .59 | 1 1/4                    | 2.250 | 4           | .030 |
| —       | —           | 5594903 | 5VNE19017BV | 5594906 | 5VNE25018BW | 3/4 | 3/4 | .71 | 1 1/2                    | 3.250 | 5.5         | .030 |
| —       | —           | 5594905 | 5VNE25018BV |         |             | 1   | 1   | .94 | 1 3/4                    | 3.250 | 5.5         | .030 |

■ Series 5V0E • VariMill II ER • Victory Grades



| Material Group |   |  |         |  |                              |   |     |                                                                                                          |               |       |       |       |        |  |
|----------------|---|-----------------------------------------------------------------------------------|---------|------------------------------------------------------------------------------------|------------------------------|---|-----|----------------------------------------------------------------------------------------------------------|---------------|-------|-------|-------|--------|--|
|                |   | Side Milling (A) and Slotting (B)                                                 |         |                                                                                    | WS15PE                       |   |     | Recommended feed per tooth (IPT = inch/th) for side milling (A).<br>For slotting (B), reduce IPT by 20%. |               |       |       |       |        |  |
|                |   | A                                                                                 |         | B                                                                                  | Cutting Speed<br>— vc<br>SFM |   |     |                                                                                                          | D1 — Diameter |       |       |       |        |  |
|                |   | ap                                                                                | ae      | ap                                                                                 | min                          |   | max | frac.                                                                                                    | 3/8           | 1/2   | 5/8   | 3/4   | 1      |  |
|                |   | ap                                                                                | ae      | ap                                                                                 | min                          |   | max | dec.                                                                                                     | .3750         | .5000 | .6250 | .7500 | 1.0000 |  |
| P              | 5 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 200                          | – | 330 | IPT                                                                                                      | .0018         | .0023 | .0027 | .0031 | .0036  |  |
|                | 6 | 1.5 x D                                                                           | 0.5 x D | 0.75 x D                                                                           | 160                          | – | 250 | IPT                                                                                                      | .0015         | .0019 | .0022 | .0025 | .0028  |  |
| M              | 1 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 300                          | – | 380 | IPT                                                                                                      | .0023         | .0029 | .0034 | .0039 | .0045  |  |
|                | 2 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 200                          | – | 260 | IPT                                                                                                      | .0018         | .0023 | .0027 | .0031 | .0036  |  |
|                | 3 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 200                          | – | 230 | IPT                                                                                                      | .0015         | .0019 | .0022 | .0025 | .0028  |  |
| S              | 1 | 1.5 x D                                                                           | 0.3 x D | 0.3 x D                                                                            | 160                          | – | 300 | IPT                                                                                                      | .0023         | .0029 | .0034 | .0039 | .0045  |  |
|                | 2 | 1.5 x D                                                                           | 0.3 x D | 0.3 x D                                                                            | 80                           | – | 130 | IPT                                                                                                      | .0012         | .0015 | .0018 | .0021 | .0024  |  |
|                | 3 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 200                          | – | 260 | IPT                                                                                                      | .0018         | .0023 | .0027 | .0031 | .0036  |  |
|                | 4 | 1.5 x D                                                                           | 0.5 x D | 1 x D                                                                              | 160                          | – | 200 | IPT                                                                                                      | .0017         | .0021 | .0025 | .0028 | .0033  |  |
| H              | 1 | 1.5 x D                                                                           | 0.5 x D | 0.75 x D                                                                           | 260                          | – | 460 | IPT                                                                                                      | .0020         | .0026 | .0030 | .0034 | .0039  |  |
|                | 2 | 1.5 x D                                                                           | 0.2 x D | 0.5 x D                                                                            | 230                          | – | 390 | IPT                                                                                                      | .0015         | .0019 | .0022 | .0025 | .0028  |  |

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.  
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.  
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

**■ Series 5VNE • VariMill II ER • With Neck • Victory Grades**


| Material Group |          |                                   |         |                        |     |     |                                                                                                       |     |       |       |       |       |       |   |
|----------------|----------|-----------------------------------|---------|------------------------|-----|-----|-------------------------------------------------------------------------------------------------------|-----|-------|-------|-------|-------|-------|---|
|                |          | Side Milling (A) and Slotting (B) |         | WS15PE                 |     |     | Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%. |     |       |       |       |       |       |   |
|                |          |                                   |         | Cutting Speed — vc SFM |     |     | D1 — Diameter                                                                                         |     |       |       |       |       |       |   |
|                |          | A                                 |         | B                      |     | min | —                                                                                                     | max | frac. | 3/8   | 1/2   | 5/8   | 3/4   | 1 |
|                |          | ap                                | ae      | ap                     |     |     |                                                                                                       |     |       |       |       |       |       |   |
| <b>P</b>       | <b>5</b> | 1.5 x D                           | 0.5 X D | 1 x D                  | 200 | —   | 330                                                                                                   | IPT | .0018 | .0023 | .0027 | .0031 | .0036 |   |
|                | <b>6</b> | 1.5 x D                           | 0.5 X D | 0.75 x D               | 160 | —   | 250                                                                                                   | IPT | .0015 | .0019 | .0022 | .0025 | .0028 |   |
| <b>M</b>       | <b>1</b> | 1.5 x D                           | 0.5 X D | 1 x D                  | 300 | —   | 380                                                                                                   | IPT | .0023 | .0029 | .0034 | .0039 | .0045 |   |
|                | <b>2</b> | 1.5 x D                           | 0.5 X D | 1 x D                  | 200 | —   | 260                                                                                                   | IPT | .0018 | .0023 | .0027 | .0031 | .0036 |   |
|                | <b>3</b> | 1.5 x D                           | 0.5 X D | 1 x D                  | 200 | —   | 230                                                                                                   | IPT | .0015 | .0019 | .0022 | .0025 | .0028 |   |
| <b>S</b>       | <b>1</b> | 1.5 x D                           | 0.3 X D | 0.3 X D                | 160 | —   | 300                                                                                                   | IPT | .0023 | .0029 | .0034 | .0039 | .0045 |   |
|                | <b>2</b> | 1.5 x D                           | 0.3 X D | 0.3 X D                | 80  | —   | 130                                                                                                   | IPT | .0012 | .0015 | .0018 | .0021 | .0024 |   |
|                | <b>3</b> | 1.5 x D                           | 0.3 X D | 0.3 X D                | 200 | —   | 260                                                                                                   | IPT | .0018 | .0023 | .0027 | .0031 | .0036 |   |
|                | <b>4</b> | 1.5 x D                           | 0.5 X D | 1 x D                  | 160 | —   | 200                                                                                                   | IPT | .0017 | .0021 | .0025 | .0028 | .0033 |   |
| <b>H</b>       | <b>1</b> | 1.5 x D                           | 0.5 X D | 0.75 x D               | 260 | —   | 460                                                                                                   | IPT | .0020 | .0026 | .0030 | .0034 | .0039 |   |
|                | <b>2</b> | 1.5 x D                           | 0.2 X D | 0.5 x D                | 230 | —   | 390                                                                                                   | IPT | .0015 | .0019 | .0022 | .0025 | .0028 |   |

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.  
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.  
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

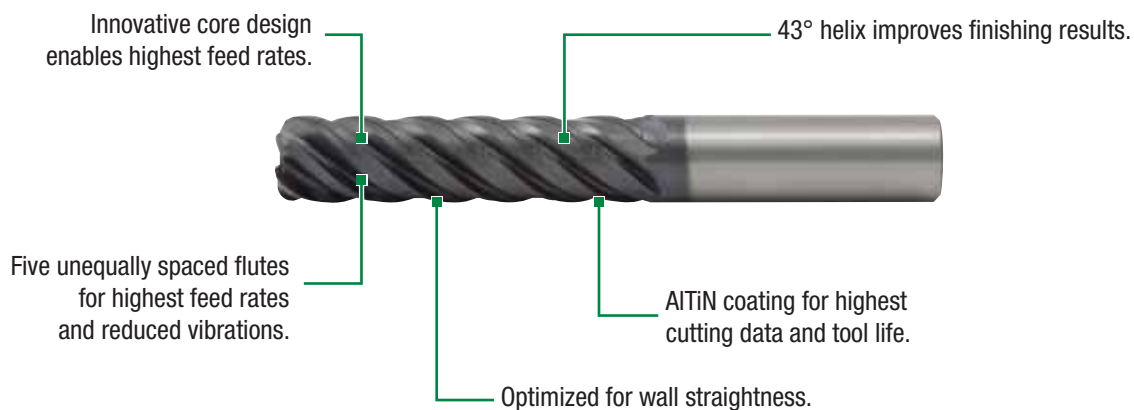
High-Performance Solid Carbide End Mills •  
**VariMill II™ Long**

# VariMill II Long



Designed to achieve highest surface quality and tool life in titanium, stainless steels, and steels. Innovative core and tool geometry design enable chatter-free corner machining in one pass. VariMill II Long covers 4 x D lengths-of-cut for semi-finishing and fine finishing operations with radii and sharp corner versions from stock.

- Tailored 43° helix improves surface finish.
- Less passes in side milling with 4 x D length-of-cut capability.
- One tool for semi-finishing and fine finishing operations.
- No need for feed rate reduction when machining corners.

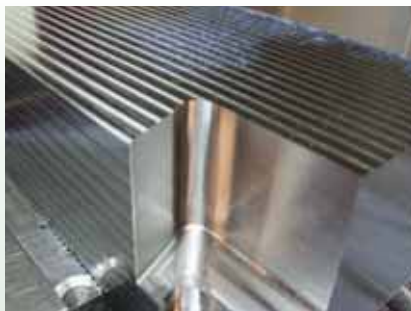
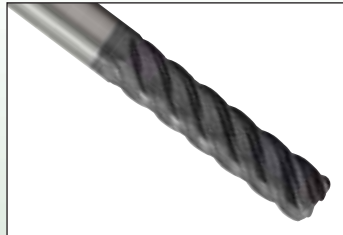


### VariMill II™ Long Series

- Achieve excellent surface finish and outstanding wall straightness.
- Benefit from high accuracy even with thin wall machining.
- Simplify your programming of cavities by keeping the feed rate and radial engagement constant.

### 5W1S Series

- Highest surface quality and tool life in:
  - Titanium
  - Stainless steels
- Corner radii and sharp edges.
- 4 x D length of cut.



### Application Example

Side milling 60° angled corner with constant feed rate.

Workpiece material: Titanium 6Al-4V

Tool: D = 5/8"

Cutting data: ap = 2.5"

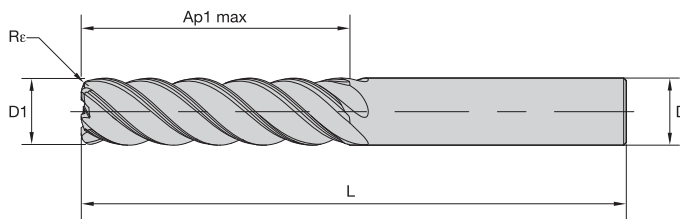
ae = .02"

vc = 328 SFM

fz = .0023 IPT

Result: Surface finish 16 RMS

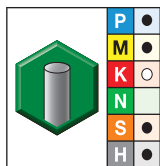
- Unequal flute spacing.
- Non-center cutting.
- For finishing and semi-finishing applications.
- Standard items listed. Additional styles and coatings made to order.



End Mill Tolerances

| D1  | tolerance      | D              | tolerance h6<br>+ / - |
|-----|----------------|----------------|-----------------------|
| All | +0.000/-0.002" | ≤1/8"          | +0/-0.00024"          |
|     |                | >1/8-1/4"      | +0/-0.00031"          |
|     |                | >1/4-3/8"      | +0/-0.00035"          |
|     |                | >3/8-23/32"    | +0/-0.00043"          |
|     |                | >23/32-1-3/16" | 0/-0.00051"           |

### Series 5W1S • VariMill II Long • 4 x D Length of Cut



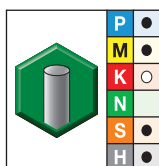
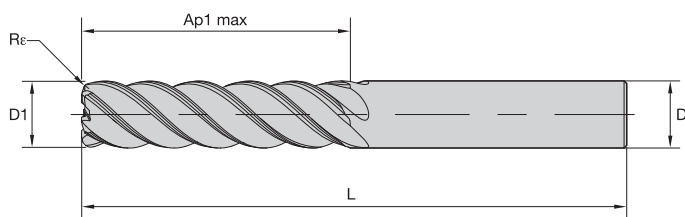
grade AlTiN-MT  
AlTiN

- first choice
- alternate choice

| order # | catalog #    | D1   | D    | length of cut<br>Ap1 max | length<br>L | Re   |
|---------|--------------|------|------|--------------------------|-------------|------|
| 5095168 | TM5W1S07002A | 1/4  | 1/4  | 1                        | 3           | .015 |
| 5095169 | TM5W1S07002B | 1/4  | 1/4  | 1                        | 3           | .030 |
| 5095167 | TM5W1S07002S | 1/4  | 1/4  | 1                        | 3           | —    |
| 5095341 | TM5W1S08003A | 5/16 | 5/16 | 1 1/4                    | 3           | .015 |
| 5095342 | TM5W1S08003B | 5/16 | 5/16 | 1 1/4                    | 3           | .030 |
| 5095340 | TM5W1S08003S | 5/16 | 5/16 | 1 1/4                    | 3           | —    |
| 5095345 | TM5W1S10004A | 3/8  | 3/8  | 1 1/2                    | 4           | .015 |
| 5095346 | TM5W1S10004B | 3/8  | 3/8  | 1 1/2                    | 4           | .030 |
| 5095347 | TM5W1S10004C | 3/8  | 3/8  | 1 1/2                    | 4           | .060 |
| 5095343 | TM5W1S10004S | 3/8  | 3/8  | 1 1/2                    | 4           | —    |
| 5095420 | TM5W1S13005A | 1/2  | 1/2  | 2                        | 5           | .015 |
| 5095421 | TM5W1S13005B | 1/2  | 1/2  | 2                        | 5           | .030 |
| 5095422 | TM5W1S13005C | 1/2  | 1/2  | 2                        | 5           | .060 |
| 5095348 | TM5W1S13005S | 1/2  | 1/2  | 2                        | 5           | —    |
| 5095425 | TM5W1S16006A | 5/8  | 5/8  | 2 1/2                    | 5 1/4       | .015 |
| 5095426 | TM5W1S16006B | 5/8  | 5/8  | 2 1/2                    | 5 1/4       | .030 |
| 5095427 | TM5W1S16006C | 5/8  | 5/8  | 2 1/2                    | 5 1/4       | .060 |
| 5095533 | TM5W1S16006D | 5/8  | 5/8  | 2 1/2                    | 5 1/4       | .090 |
| 5095428 | TM5W1S16006E | 5/8  | 5/8  | 2 1/2                    | 5 1/4       | .120 |
| 5095423 | TM5W1S16006S | 5/8  | 5/8  | 2 1/2                    | 5 1/4       | —    |

(continued)

(Series 5W1S • VariMill II Long • 4 x D Length of Cut — continued)



● first choice  
○ alternate choice

| grade AlTiN-MT<br>AlTiN |              |     |     |                          |             |      |
|-------------------------|--------------|-----|-----|--------------------------|-------------|------|
| order #                 | catalog #    | D1  | D   | length of cut<br>Ap1 max | length<br>L | Re   |
| 5095471                 | TM5W6S19007A | 3/4 | 3/4 | 3                        | 6           | .015 |
| 5095472                 | TM5W1S19007B | 3/4 | 3/4 | 3                        | 6           | .030 |
| 5095473                 | TM5W1S19007C | 3/4 | 3/4 | 3                        | 6           | .060 |
| 5095534                 | TM5W1S19007D | 3/4 | 3/4 | 3                        | 6           | .090 |
| 5095474                 | TM5W1S19007E | 3/4 | 3/4 | 3                        | 6           | .120 |
| 5095429                 | TM5W1S19007S | 3/4 | 3/4 | 3                        | 6           | —    |
| 5095477                 | TM5W1S25008A | 1   | 1   | 4                        | 7           | .015 |
| 5095530                 | TM5W1S25008B | 1   | 1   | 4                        | 7           | .030 |
| 5095531                 | TM5W1S25008C | 1   | 1   | 4                        | 7           | .060 |
| 5095535                 | TM5W1S25008D | 1   | 1   | 4                        | 7           | .090 |
| 5095532                 | TM5W1S25008E | 1   | 1   | 4                        | 7           | .120 |
| 5095475                 | TM5W1S25008S | 1   | 1   | 4                        | 7           | —    |

High-Performance Solid Carbide End Mills

### ■ Series 5W1S • VariMill II Long

| Material Group |   |  |           |  |      |                                                                  |       |       |       |       |       |       |       |
|----------------|---|-----------------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------------|------|------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|
|                |   | Side Milling (A)                                                                  |           | AlTiN-MT                                                                           |      | Recommended feed per tooth (IPT = inch/th) for side milling (A). |       |       |       |       |       |       |       |
|                |   | A                                                                                 |           | Cutting Speed — vc<br>SFM                                                          |      | D1 — Diameter                                                    |       |       |       |       |       |       |       |
|                |   | ap                                                                                | ae        | min                                                                                | max  | frac.                                                            | 1/4   | 5/16  | 3/8   | 1/2   | 5/8   | 3/4   | 1     |
| P              | 1 | Ap1 max                                                                           | 0.05 x D* | 990                                                                                | 1320 | IPT                                                              | .0018 | .0023 | .0027 | .0035 | .0039 | .0043 | .0050 |
|                | 2 | Ap1 max                                                                           | 0.05 x D* | 924                                                                                | 1254 | IPT                                                              | .0018 | .0023 | .0027 | .0035 | .0039 | .0043 | .0050 |
|                | 3 | Ap1 max                                                                           | 0.05 x D* | 792                                                                                | 1056 | IPT                                                              | .0015 | .0020 | .0023 | .0029 | .0034 | .0038 | .0046 |
|                | 4 | Ap1 max                                                                           | 0.05 x D* | 594                                                                                | 990  | IPT                                                              | .0014 | .0018 | .0020 | .0026 | .0030 | .0033 | .0039 |
|                | 5 | Ap1 max                                                                           | 0.05 x D* | 396                                                                                | 660  | IPT                                                              | .0012 | .0016 | .0018 | .0023 | .0027 | .0030 | .0036 |
|                | 6 | Ap1 max                                                                           | 0.05 x D* | 330                                                                                | 495  | IPT                                                              | .0010 | .0013 | .0015 | .0019 | .0022 | .0024 | .0028 |
| M              | 1 | Ap1 max                                                                           | 0.05 x D* | 594                                                                                | 759  | IPT                                                              | .0015 | .0020 | .0023 | .0029 | .0034 | .0038 | .0046 |
|                | 2 | Ap1 max                                                                           | 0.05 x D* | 396                                                                                | 528  | IPT                                                              | .0012 | .0016 | .0018 | .0023 | .0027 | .0030 | .0036 |
|                | 3 | Ap1 max                                                                           | 0.05 x D* | 396                                                                                | 462  | IPT                                                              | .0010 | .0013 | .0015 | .0019 | .0022 | .0024 | .0028 |
| K              | 1 | Ap1 max                                                                           | 0.05 x D* | 792                                                                                | 990  | IPT                                                              | .0018 | .0023 | .0027 | .0035 | .0039 | .0043 | .0050 |
|                | 2 | Ap1 max                                                                           | 0.05 x D* | 726                                                                                | 858  | IPT                                                              | .0015 | .0020 | .0028 | .0029 | .0034 | .0038 | .0046 |
|                | 3 | Ap1 max                                                                           | 0.05 x D* | 660                                                                                | 858  | IPT                                                              | .0012 | .0016 | .0018 | .0023 | .0027 | .0030 | .0036 |
| S              | 1 | Ap1 max                                                                           | 0.05 x D* | 330                                                                                | 594  | IPT                                                              | .0015 | .0020 | .0028 | .0029 | .0034 | .0038 | .0046 |
|                | 2 | Ap1 max                                                                           | 0.05 x D* | 165                                                                                | 264  | IPT                                                              | .0008 | .0010 | .0012 | .0016 | .0018 | .0020 | .0025 |
|                | 3 | Ap1 max                                                                           | 0.05 x D* | 396                                                                                | 528  | IPT                                                              | .0012 | .0016 | .0018 | .0023 | .0027 | .0030 | .0036 |
|                | 4 | Ap1 max                                                                           | 0.05 x D* | 330                                                                                | 396  | IPT                                                              | .0011 | .0014 | .0017 | .0022 | .0025 | .0028 | .0033 |
| H              | 1 | Ap1 max                                                                           | 0.05 x D* | 462                                                                                | 528  | IPT                                                              | .0014 | .0018 | .0020 | .0026 | .0030 | .0033 | .0039 |

\*For the above cutting data, do not exceed an overall ae of .032".

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

# X-Feed™ End Mills for High- Feed Milling



EXTREME **CHALLENGES.**  
EXTREME **RESULTS.**

**Specifically engineered to machine hardened steel up to 67 HRC at extreme speeds and feeds**

- Unique tool with new 6-flute style for high productivity.
- Necked shanks provide extended reach in deep cavities.
- High feed rates, up to 0.24" per tooth on a 3/4" tool.
- Machine hardened materials at 2–3x the metal removal rate of competitive end mills.
- Wide range of cutting diameters: down to 1/4" for small and medium pocket work.
- Innovative new geometry maximizes metal removal rates.
- High metal removal rates and lower manufacturing costs.

To learn more about our innovations, contact your local Authorized Distributor or visit [widia.com](http://widia.com).

**WIDIA** 

High-Performance Solid Carbide End Mills •

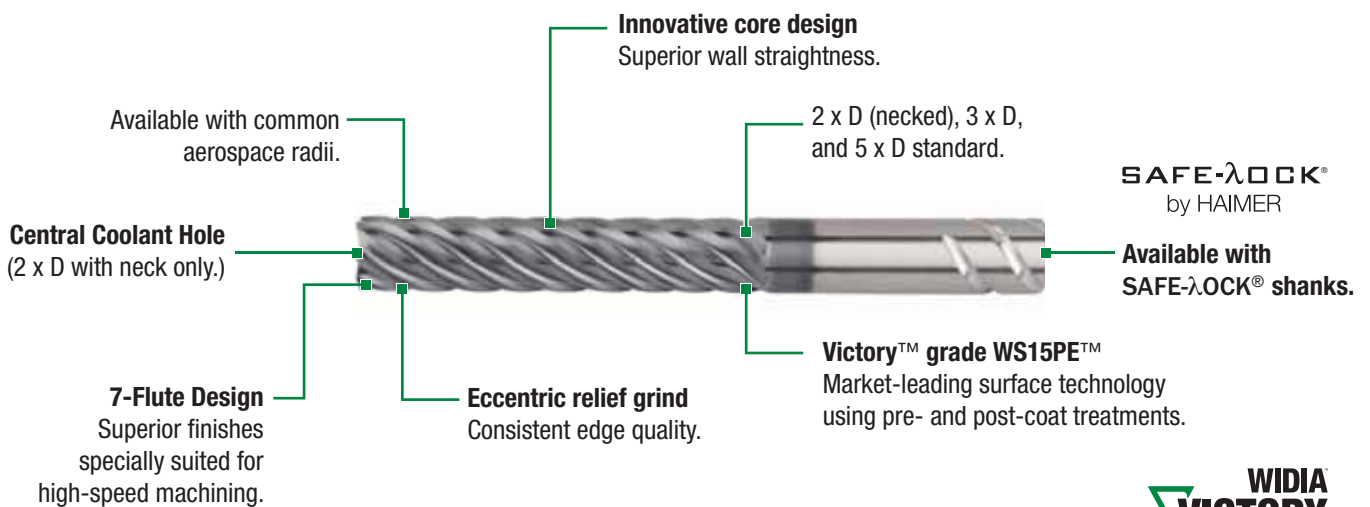
**VariMill III™ ER**

# VariMill III ER



The trend towards more efficiency and increased productivity using high-speed machining techniques such as trochoidal and peel milling will continue to be a focus for aerospace components. The new VariMill III ER is designed to provide the highest Metal Removal Rates (MRR) and extended tool life in the most demanding materials in the aerospace industry. VariMill III ER is designed to be applied in titanium and stainless steel workpiece materials for both semi-finishing and finishing applications.

- 7-flute eccentric relief design provides edge strength along with high productivity.
- Superior surface finishes and wall straightness capability from specialized core.
- Finishing and semi-finishing at up to 30% of the diameter with one tool.
- Central coolant hole on necked 2 x D length-of-cut tools designed for pocketing applications.
- First choice for high-speed machining in difficult-to-cut workpiece materials.



**WIDIA**  
**VICTORY**

**VariMill III™ ER Series**

- Seven unequally spaced flutes provide the maximum output and surface quality.
- Eccentric relief for edge strength and stability.
- Semi-finishing and finishing with one tool.
- Victory™ grade WS15PE™ for increased heat and wear resistance.

**7VNX Series**

- Titanium and stainless steel geometry design.
- Corner radii.
- 2 x D length of cut.
- Necked 5 x D reach.
- Central coolant hole.
- **SAFE-λ.OCK®**.

**7V2E Series**

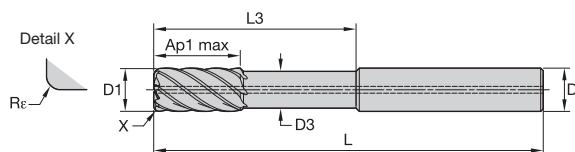
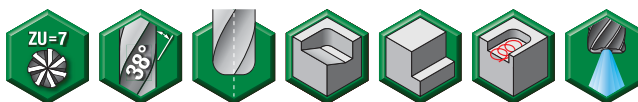
- Titanium and stainless steel geometry design.
- Corner radii.
- 5 x D length of cut.
- Center cutting.
- **SAFE-λ.OCK®**.

**7V1E Series**

- Titanium and stainless steel geometry design.
- Corner radii.
- 3 x D length of cut.
- Center cutting.
- **SAFE-λ.OCK®**.



- Unequal flute spacing.
- Non-center cutting.
- Ramping angle 3°.
- Coolant through the tool.
- Optimized for difficult-to-machine workpiece materials.
- Semi-finishing to finishing applications.
- Standard items listed. Additional styles and coatings made to order.

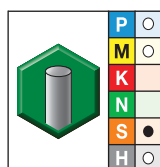


End Mill Tolerances

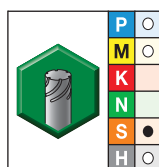
| D1  | tolerance    | D               | tolerance h6<br>+ / - |
|-----|--------------|-----------------|-----------------------|
| All | +.000/- .002 | ≤ 1/8"          | 0/.00024              |
|     |              | > 1/8-1/4"      | 0/.00031              |
|     |              | > 1/4-3/8"      | 0/.00035              |
|     |              | > 3/8-23/32"    | 0/.00043              |
|     |              | > 23/32-1 3/16" | 0/.00051              |



## ■ Series 7VNX • VariMill III ER • With Neck • Coolant Hole • Victory Grades



grade WS15PE  
AITiN

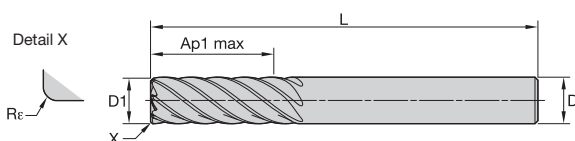


grade WS15PE  
AITiN

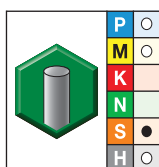
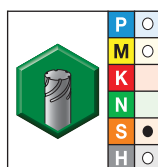
- first choice
- alternate choice

| order # | catalog #   | order # | catalog #   | D1  | D   | D3  | length of cut<br>Ap1 max | L3    | length<br>L | Rε   |
|---------|-------------|---------|-------------|-----|-----|-----|--------------------------|-------|-------------|------|
| 5971348 | 7VNX10004AT | —       | —           | 3/8 | 3/8 | .35 | 3/4                      | 2.125 | 4           | .015 |
| 5971349 | 7VNX10004BT | —       | —           | 3/8 | 3/8 | .35 | 3/4                      | 2.125 | 4           | .030 |
| 5971424 | 7VNX13005BT | —       | —           | 1/2 | 1/2 | .47 | 1                        | 2.375 | 4 1/2       | .030 |
| 5971425 | 7VNX13005CT | —       | —           | 1/2 | 1/2 | .47 | 1                        | 2.375 | 4 1/2       | .060 |
| 5971426 | 7VNX13005ET | —       | —           | 1/2 | 1/2 | .47 | 1                        | 2.375 | 4 1/2       | .120 |
| 5971433 | 7VNX16006BT | —       | —           | 5/8 | 5/8 | .59 | 1 1/4                    | 2.750 | 5           | .030 |
| 5971434 | 7VNX16006CT | —       | —           | 5/8 | 5/8 | .59 | 1 1/4                    | 2.750 | 5           | .060 |
| 5971439 | 7VNX19007BT | 5971442 | 7VNX19007BV | 3/4 | 3/4 | .71 | 1 1/2                    | 3.125 | 5 1/2       | .030 |
| 5971440 | 7VNX19007CT | 5971443 | 7VNX19007CV | 3/4 | 3/4 | .71 | 1 1/2                    | 3.125 | 5 1/2       | .060 |
| 5971441 | 7VNX19007ET | 5971444 | 7VNX19007EV | 3/4 | 3/4 | .71 | 1 1/2                    | 3.125 | 5 1/2       | .120 |
| 5971454 | 7VNX25008CT | 5971455 | 7VNX25008CV | 1   | 1   | .94 | 2                        | 3.375 | 6           | .060 |

- Unequal flute spacing.
- Center cutting.
- Ramping angle 3°.
- Optimized for difficult-to-machine workpiece materials.
- Semi-finishing to finishing applications.
- High-speed machining capability.
- Standard items listed. Additional styles and coatings made to order.


**WIDIA**  
**VICTORY**
**End Mill Tolerances**

| D1  | tolerance    | D               | tolerance h6<br>+ / - |
|-----|--------------|-----------------|-----------------------|
| All | +.000/- .002 | ≤ 1/8"          | 0/.00024              |
|     |              | > 1/8-1/4"      | 0/.00031              |
|     |              | > 1/4-3/8"      | 0/.00035              |
|     |              | > 3/8-23/32"    | 0/.00043              |
|     |              | > 23/32-1 3/16" | 0/.00051              |

**Series 7V1E 7V2E • VariMill III ER • Victory Grades**

**grade WS15PE  
AITiN**

**grade WS15PE  
AITiN**

- first choice
- alternate choice

| order # | catalog #   | order # | catalog #   | D1  | D   | length of cut<br>Ap1 max | length<br>L | Rr   |
|---------|-------------|---------|-------------|-----|-----|--------------------------|-------------|------|
| 5971350 | 7V1E10004AT | —       | —           | 3/8 | 3/8 | 1 1/8                    | 3           | .015 |
| 5971421 | 7V1E10004BT | —       | —           | 3/8 | 3/8 | 1 1/8                    | 3           | .030 |
| 5971422 | 7V2E10004AT | —       | —           | 3/8 | 3/8 | 1 7/8                    | 4           | .015 |
| 5971423 | 7V2E10004BT | —       | —           | 3/8 | 3/8 | 1 7/8                    | 4           | .030 |
| 5971427 | 7V1E13005BT | —       | —           | 1/2 | 1/2 | 1 1/2                    | 3 1/2       | .030 |
| 5971428 | 7V1E13005CT | —       | —           | 1/2 | 1/2 | 1 1/2                    | 3 1/2       | .060 |
| 5971429 | 7V1E13005ET | —       | —           | 1/2 | 1/2 | 1 1/2                    | 3 1/2       | .120 |
| —       | —           | 5971430 | 7V2E13005BV | 1/2 | 1/2 | 2 1/2                    | 4 1/2       | .030 |
| —       | —           | 5971431 | 7V2E13005CV | 1/2 | 1/2 | 2 1/2                    | 4 1/2       | .060 |
| —       | —           | 5971432 | 7V2E13005EV | 1/2 | 1/2 | 2 1/2                    | 4 1/2       | .120 |
| 5971435 | 7V1E16006BT | —       | —           | 5/8 | 5/8 | 1 7/8                    | 4           | .030 |
| 5971436 | 7V1E16006CT | —       | —           | 5/8 | 5/8 | 1 7/8                    | 4           | .060 |
| —       | —           | 5971437 | 7V2E16006BV | 5/8 | 5/8 | 3 1/8                    | 5 1/2       | .030 |
| —       | —           | 5971438 | 7V2E16006CV | 5/8 | 5/8 | 3 1/8                    | 5 1/2       | .060 |
| 5971445 | 7V1E19007BT | 5971448 | 7V1E19007BV | 3/4 | 3/4 | 2 1/4                    | 5           | .030 |
| 5971446 | 7V1E19007CT | 5971449 | 7V1E19007CV | 3/4 | 3/4 | 2 1/4                    | 5           | .060 |
| 5971447 | 7V1E19007ET | 5971450 | 7V1E19007EV | 3/4 | 3/4 | 2 1/4                    | 5           | .120 |
| —       | —           | 5971451 | 7V2E19007BV | 3/4 | 3/4 | 3 3/4                    | 6           | .030 |
| —       | —           | 5971452 | 7V2E19007CV | 3/4 | 3/4 | 3 3/4                    | 6           | .060 |
| —       | —           | 5971453 | 7V2E19007EV | 3/4 | 3/4 | 3 3/4                    | 6           | .120 |
| 5971456 | 7V1E25008CT | 5971457 | 7V1E25008CV | 1   | 1   | 3                        | 5 1/2       | .060 |
| —       | —           | 5971458 | 7V2E25008CV | 1   | 1   | 5                        | 7 1/2       | .060 |

■ Series 7VNX • VariMill III ER • With Neck • Semi-Finishing • Victory Grades



| Material Group |   |                  |         |                              |   |     |                                                                  |       |       |       |       |       |
|----------------|---|------------------|---------|------------------------------|---|-----|------------------------------------------------------------------|-------|-------|-------|-------|-------|
|                |   | Side Milling (A) |         | WS15PE                       |   |     | Recommended feed per tooth (IPT = inch/th) for side milling (A). |       |       |       |       |       |
|                |   | A                |         | Cutting Speed<br>— vc<br>SFM |   |     | D1 — Diameter                                                    |       |       |       |       |       |
|                |   | ap               | ae      | min                          |   | max | frac.<br>dec.                                                    | 3/8   | 1/2   | 5/8   | 3/4   | 1     |
| P              | 4 | Ap1 max          | 0.3 x D | 300                          | — | 490 | IPT                                                              | .0020 | .0026 | .0030 | .0034 | .0039 |
|                | 5 | Ap1 max          | 0.3 x D | 200                          | — | 330 | IPT                                                              | .0018 | .0023 | .0027 | .0031 | .0036 |
| M              | 1 | Ap1 max          | 0.3 x D | 300                          | — | 380 | IPT                                                              | .0023 | .0029 | .0034 | .0039 | .0045 |
|                | 2 | Ap1 max          | 0.3 x D | 200                          | — | 260 | IPT                                                              | .0018 | .0023 | .0027 | .0031 | .0036 |
|                | 3 | Ap1 max          | 0.3 x D | 200                          | — | 230 | IPT                                                              | .0015 | .0019 | .0022 | .0025 | .0028 |
| S              | 1 | Ap1 max          | 0.3 x D | 160                          | — | 300 | IPT                                                              | .0023 | .0029 | .0034 | .0039 | .0045 |
|                | 2 | Ap1 max          | 0.3 x D | 80                           | — | 130 | IPT                                                              | .0012 | .0015 | .0018 | .0021 | .0024 |
|                | 3 | Ap1 max          | 0.3 x D | 200                          | — | 260 | IPT                                                              | .0018 | .0023 | .0027 | .0031 | .0036 |
|                | 4 | Ap1 max          | 0.3 x D | 160                          | — | 200 | IPT                                                              | .0017 | .0021 | .0025 | .0028 | .0033 |
| H              | 1 | Ap1 max          | 0.3 x D | 260                          | — | 460 | IPT                                                              | .0020 | .0026 | .0030 | .0034 | .0039 |
|                | 2 | Ap1 max          | 0.3 x D | 230                          | — | 390 | IPT                                                              | .0015 | .0019 | .0022 | .0025 | .0028 |

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.  
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.  
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ Series 7VNX • VariMill III ER • With Neck • Finishing • Victory Grades



| Material Group |   |                  |          |                              |   |     |                                                                  |       |       |       |       |       |
|----------------|---|------------------|----------|------------------------------|---|-----|------------------------------------------------------------------|-------|-------|-------|-------|-------|
|                |   | Side Milling (A) |          | WS15PE                       |   |     | Recommended feed per tooth (IPT = inch/th) for side milling (A). |       |       |       |       |       |
|                |   | A                |          | Cutting Speed<br>— vc<br>SFM |   |     | D1 — Diameter                                                    |       |       |       |       |       |
|                |   | ap               | ae       | min                          |   | max | frac.<br>dec.                                                    | 3/8   | 1/2   | 5/8   | 3/4   | 1     |
| P              | 4 | Ap1 max          | 0.06 x D | 590                          | — | 980 | IPT                                                              | .0025 | .0031 | .0036 | .0040 | .0046 |
|                | 5 | Ap1 max          | 0.06 x D | 390                          | — | 660 | IPT                                                              | .0022 | .0028 | .0033 | .0037 | .0043 |
| M              | 1 | Ap1 max          | 0.06 x D | 590                          | — | 750 | IPT                                                              | .0027 | .0035 | .0041 | .0046 | .0054 |
|                | 2 | Ap1 max          | 0.06 x D | 390                          | — | 520 | IPT                                                              | .0022 | .0028 | .0033 | .0037 | .0043 |
|                | 3 | Ap1 max          | 0.06 x D | 390                          | — | 460 | IPT                                                              | .0018 | .0023 | .0027 | .0030 | .0034 |
| S              | 1 | Ap1 max          | 0.06 x D | 330                          | — | 590 | IPT                                                              | .0027 | .0035 | .0041 | .0046 | .0054 |
|                | 2 | Ap1 max          | 0.06 x D | 160                          | — | 260 | IPT                                                              | .0015 | .0018 | .0022 | .0025 | .0029 |
|                | 3 | Ap1 max          | 0.06 x D | 390                          | — | 520 | IPT                                                              | .0022 | .0028 | .0033 | .0037 | .0043 |
|                | 4 | Ap1 max          | 0.06 x D | 330                          | — | 390 | IPT                                                              | .0020 | .0026 | .0030 | .0034 | .0040 |
| H              | 1 | Ap1 max          | 0.06 x D | 520                          | — | 920 | IPT                                                              | .0025 | .0031 | .0036 | .0040 | .0046 |
|                | 2 | Ap1 max          | 0.06 x D | 460                          | — | 790 | IPT                                                              | .0018 | .0023 | .0027 | .0030 | .0034 |

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.  
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.  
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

**■ Series 7V1E • VariMill III ER • Semi-Finishing • Victory Grades**


| Material Group |   |  |         |  |   |     |                                                                  |       |       |       |       |       |
|----------------|---|-----------------------------------------------------------------------------------|---------|------------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------|-------|-------|-------|-------|-------|
|                |   | Side Milling (A)                                                                  |         | WS15PE                                                                             |   |     | Recommended feed per tooth (IPT = inch/th) for side milling (A). |       |       |       |       |       |
|                |   | A                                                                                 |         | Cutting Speed<br>— vc<br>SFM                                                       |   |     | D1 — Diameter                                                    |       |       |       |       |       |
|                |   | ap                                                                                | ae      | min                                                                                |   | max | frac.<br>dec.                                                    | 3/8   | 1/2   | 5/8   | 3/4   | 1     |
| P              | 4 | 3 x D                                                                             | 0.2 x D | 300                                                                                | — | 490 | IPT                                                              | .0020 | .0026 | .0030 | .0034 | .0039 |
|                | 5 | 3 x D                                                                             | 0.2 x D | 200                                                                                | — | 330 | IPT                                                              | .0018 | .0023 | .0027 | .0031 | .0036 |
| M              | 1 | 3 x D                                                                             | 0.2 x D | 300                                                                                | — | 380 | IPT                                                              | .0023 | .0029 | .0034 | .0039 | .0045 |
|                | 2 | 3 x D                                                                             | 0.2 x D | 200                                                                                | — | 260 | IPT                                                              | .0018 | .0023 | .0027 | .0031 | .0036 |
|                | 3 | 3 x D                                                                             | 0.2 x D | 200                                                                                | — | 230 | IPT                                                              | .0015 | .0019 | .0022 | .0025 | .0028 |
| S              | 1 | 3 x D                                                                             | 0.2 x D | 160                                                                                | — | 300 | IPT                                                              | .0023 | .0029 | .0034 | .0039 | .0045 |
|                | 2 | 3 x D                                                                             | 0.2 x D | 80                                                                                 | — | 130 | IPT                                                              | .0012 | .0015 | .0018 | .0021 | .0024 |
|                | 3 | 3 x D                                                                             | 0.2 x D | 200                                                                                | — | 260 | IPT                                                              | .0018 | .0023 | .0027 | .0031 | .0036 |
|                | 4 | 3 x D                                                                             | 0.2 x D | 160                                                                                | — | 200 | IPT                                                              | .0017 | .0021 | .0025 | .0028 | .0033 |
| H              | 1 | 3 x D                                                                             | 0.2 x D | 260                                                                                | — | 460 | IPT                                                              | .0020 | .0026 | .0030 | .0034 | .0039 |
|                | 2 | 3 x D                                                                             | 0.2 x D | 230                                                                                | — | 390 | IPT                                                              | .0015 | .0019 | .0022 | .0025 | .0028 |

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.  
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.  
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

**■ Series 7V1E • VariMill III ER • Finishing • Victory Grades**


| Material Group |   |  |          |  |   |     |                                                                  |       |       |       |       |       |
|----------------|---|-------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------|-------|-------|-------|-------|-------|
|                |   | Side Milling (A)                                                                    |          | WS15PE                                                                               |   |     | Recommended feed per tooth (IPT = inch/th) for side milling (A). |       |       |       |       |       |
|                |   | A                                                                                   |          | Cutting Speed<br>— vc<br>SFM                                                         |   |     | D1 — Diameter                                                    |       |       |       |       |       |
|                |   | ap                                                                                  | ae       | min                                                                                  |   | max | frac.<br>dec.                                                    | 3/8   | 1/2   | 5/8   | 3/4   | 1     |
| P              | 4 | 3 x D                                                                               | 0.06 x D | 590                                                                                  | — | 980 | IPT                                                              | .0025 | .0031 | .0036 | .0040 | .0046 |
|                | 5 | 3 x D                                                                               | 0.06 x D | 390                                                                                  | — | 660 | IPT                                                              | .0022 | .0028 | .0033 | .0037 | .0043 |
| M              | 1 | 3 x D                                                                               | 0.06 x D | 590                                                                                  | — | 750 | IPT                                                              | .0027 | .0035 | .0041 | .0046 | .0054 |
|                | 2 | 3 x D                                                                               | 0.06 x D | 390                                                                                  | — | 520 | IPT                                                              | .0022 | .0028 | .0033 | .0037 | .0043 |
|                | 3 | 3 x D                                                                               | 0.06 x D | 390                                                                                  | — | 460 | IPT                                                              | .0018 | .0023 | .0027 | .0030 | .0034 |
| S              | 1 | 3 x D                                                                               | 0.06 x D | 330                                                                                  | — | 590 | IPT                                                              | .0027 | .0035 | .0041 | .0046 | .0054 |
|                | 2 | 3 x D                                                                               | 0.06 x D | 160                                                                                  | — | 260 | IPT                                                              | .0015 | .0018 | .0022 | .0025 | .0029 |
|                | 3 | 3 x D                                                                               | 0.06 x D | 390                                                                                  | — | 520 | IPT                                                              | .0022 | .0028 | .0033 | .0037 | .0043 |
|                | 4 | 3 x D                                                                               | 0.06 x D | 330                                                                                  | — | 390 | IPT                                                              | .0020 | .0026 | .0030 | .0034 | .0040 |
| H              | 1 | 3 x D                                                                               | 0.06 x D | 520                                                                                  | — | 920 | IPT                                                              | .0025 | .0031 | .0036 | .0040 | .0046 |
|                | 2 | 3 x D                                                                               | 0.06 x D | 460                                                                                  | — | 790 | IPT                                                              | .0018 | .0023 | .0027 | .0030 | .0034 |

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.  
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.  
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ Series 7V2E • VariMill III ER • Finishing • Victory Grades



| Material Group |   |  |          |  |   |      |                                                                  |               |       |       |       |       |
|----------------|---|-----------------------------------------------------------------------------------|----------|------------------------------------------------------------------------------------|---|------|------------------------------------------------------------------|---------------|-------|-------|-------|-------|
|                |   | Side Milling (A)                                                                  |          | WS15PE                                                                             |   |      | Recommended feed per tooth (IPT = inch/th) for side milling (A). |               |       |       |       |       |
|                |   | A                                                                                 |          | Cutting Speed<br>— vc<br>SFM                                                       |   |      | frac.<br>dec.                                                    | D1 — Diameter |       |       |       |       |
|                |   | ap                                                                                | ae       | min                                                                                |   | max  |                                                                  | 3/8           | 1/2   | 5/8   | 3/4   | 1     |
| P              | 0 | 5 x D                                                                             | 0.05 x D | 980                                                                                | — | 1310 | IPT                                                              | .0033         | .0041 | .0047 | .0053 | .0059 |
|                | 1 | 5 x D                                                                             | 0.05 x D | 980                                                                                | — | 1310 | IPT                                                              | .0033         | .0041 | .0047 | .0053 | .0059 |
|                | 2 | 5 x D                                                                             | 0.05 x D | 920                                                                                | — | 1250 | IPT                                                              | .0033         | .0041 | .0047 | .0053 | .0059 |
|                | 3 | 5 x D                                                                             | 0.05 x D | 790                                                                                | — | 1050 | IPT                                                              | .0027         | .0035 | .0041 | .0046 | .0054 |
|                | 4 | 5 x D                                                                             | 0.05 x D | 590                                                                                | — | 980  | IPT                                                              | .0025         | .0031 | .0036 | .0040 | .0046 |
|                | 5 | 5 x D                                                                             | 0.05 x D | 390                                                                                | — | 660  | IPT                                                              | .0022         | .0028 | .0033 | .0037 | .0043 |
| M              | 6 | 5 x D                                                                             | 0.05 x D | 330                                                                                | — | 490  | IPT                                                              | .0018         | .0023 | .0027 | .0030 | .0034 |
|                | 1 | 5 x D                                                                             | 0.05 x D | 590                                                                                | — | 750  | IPT                                                              | .0027         | .0035 | .0041 | .0046 | .0054 |
|                | 2 | 5 x D                                                                             | 0.05 x D | 390                                                                                | — | 520  | IPT                                                              | .0022         | .0028 | .0033 | .0037 | .0043 |
| K              | 3 | 5 x D                                                                             | 0.05 x D | 390                                                                                | — | 460  | IPT                                                              | .0018         | .0023 | .0027 | .0030 | .0034 |
|                | 1 | 5 x D                                                                             | 0.05 x D | 790                                                                                | — | 980  | IPT                                                              | .0033         | .0041 | .0047 | .0053 | .0059 |
|                | 2 | 5 x D                                                                             | 0.05 x D | 720                                                                                | — | 920  | IPT                                                              | .0027         | .0035 | .0041 | .0046 | .0054 |
| S              | 3 | 5 x D                                                                             | 0.05 x D | 720                                                                                | — | 850  | IPT                                                              | .0022         | .0028 | .0033 | .0037 | .0043 |
|                | 1 | 5 x D                                                                             | 0.05 x D | 330                                                                                | — | 590  | IPT                                                              | .0027         | .0035 | .0041 | .0046 | .0054 |
|                | 2 | 5 x D                                                                             | 0.05 x D | 160                                                                                | — | 260  | IPT                                                              | .0015         | .0018 | .0022 | .0025 | .0029 |
|                | 3 | 5 x D                                                                             | 0.05 x D | 390                                                                                | — | 520  | IPT                                                              | .0022         | .0028 | .0033 | .0037 | .0043 |
| H              | 4 | 5 x D                                                                             | 0.05 x D | 330                                                                                | — | 390  | IPT                                                              | .0020         | .0026 | .0030 | .0034 | .0040 |
|                | 1 | 5 x D                                                                             | 0.05 x D | 520                                                                                | — | 920  | IPT                                                              | .0025         | .0031 | .0036 | .0040 | .0046 |
|                | 2 | 5 x D                                                                             | 0.06 x D | 460                                                                                | — | 790  | IPT                                                              | .0018         | .0023 | .0027 | .0030 | .0034 |

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.  
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.  
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.