




## List 8210 - A Brand AE-CR-VMS : 4 Flute, Multiple Lengths, Corner Radius

## List 8215 - A Brand AE-CR-VMS : 4 Flute, Regular Length, Corner Radius

### Side Milling

| Hardness  | -   | Up to 30 HRC                |               | -                | -                          | -              | -                              | -           | -  | -           | -             | 30-45 HRC   |               |             |               |    |      |      |
|---|---|-----------------------------|---------------|------------------|----------------------------|----------------|--------------------------------|-------------|--|-------------|---------------|-------------|---------------|-------------|---------------|----|------|------|
| Work Material   | Mild Steels<br>Carbon Steels<br>Cast Iron   | Tool Steels<br>Alloy Steels |               | Stainless Steels | Precipitation<br>Stainless | Titanium Alloy | Ni-Based Alloys<br>Inconel 718 |             | Prehardened<br>Steels<br>Hardened Steels |             |               |             |               |             |               |    |      |      |
| Cutting Speed (SFM)   | 330-490   | 330-490                     |               | 200-330          | 230-300                    | 200-260        | 80-130                         |             | 260-395                                  |             |               |             |               |             |               |    |      |      |
| Depth of Cut<br> | <table border="1"> <tr> <th>aa</th> <th>ar</th> </tr> <tr> <td>1.5D</td> <td>0.2D</td> </tr> </table> |                             |               |                  |                            |                |                                |             |  |             |               |             |               |             | aa            | ar | 1.5D | 0.2D |
|   |   |                             |               |                  |                            |                |                                |             |  |             |               |             |               |             | aa            | ar |      |      |
| 1.5D  | 0.2D  |                             |               |                  |                            |                |                                |             |  |             |               |             |               |             |               |    |      |      |
| Mill Dia.   |   | Speed (RPM)                 | Feed (in/min) | Speed (RPM)      | Feed (in/min)              | Speed (RPM)    | Feed (in/min)                  | Speed (RPM) | Feed (in/min)                            | Speed (RPM) | Feed (in/min) | Speed (RPM) | Feed (in/min) | Speed (RPM) | Feed (in/min) |    |      |      |
| Inch  | mm  |                             |               |                  |                            |                |                                |             |  |             |               |             |               |             |               |    |      |      |
| -   | 3   | 13,896                      | 55.6          | 12,765           | 35.7                       | 8,079          | 16.2                           | 9760        | 20.1                                     | 8490        | 18.9          | 4240        | 8.7           | 10,664      | 25.6          |    |      |      |
| -   | 4   | 10,422                      | 62.5          | 9,573            | 38.3                       | 6,059          | 19.4                           | 7320        | 21.7                                     | 6370        | 20.9          | 3180        | 9.4           | 7,998       | 25.6          |    |      |      |
| 3/16  | -   | 8,753                       | 52.5          | 8,041            | 32.2                       | 5,089          | 16.3                           | 6016        | 22.0                                     | 5347        | 21.2          | 2674        | 9.7           | 6,718       | 21.5          |    |      |      |
| -   | 5   | 8,337                       | 66.7          | 7,659            | 39.8                       | 4,847          | 17.5                           | 5860        | 22.0                                     | 5090        | 21.3          | 2550        | 9.8           | 6,398       | 28.2          |    |      |      |
| -   | 6   | 6,948                       | 77.8          | 6,382            | 56.2                       | 4,201          | 21.8                           | 4880        | 22.8                                     | 4240        | 21.7          | 2120        | 9.8           | 5,332       | 38.4          |    |      |      |
| 1/4   | -   | 6,565                       | 73.5          | 6,031            | 53.1                       | 3,969          | 20.6                           | 4512        | 21.9                                     | 4010        | 20.8          | 2005        | 9.7           | 5,038       | 36.3          |    |      |      |
| 5/16  | -   | 5,252                       | 58.8          | 4,824            | 42.5                       | 3,176          | 16.5                           | 3609        | 17.9                                     | 3208        | 17.1          | 1604        | 9.1           | 4,031       | 29.0          |    |      |      |
| -   | 8   | 5,211                       | 66.7          | 4,787            | 57.4                       | 3,151          | 21.4                           | 3200        | 17.7                                     | 2790        | 16.9          | 1590        | 9.1           | 3,999       | 36.8          |    |      |      |
| 3/8   | -   | 4,377                       | 56.0          | 4,020            | 48.2                       | 2,646          | 18.0                           | 3008        | 17.1                                     | 2674        | 16.3          | 1337        | 8.8           | 3,359       | 30.9          |    |      |      |
| -   | 10  | 4,169                       | 61.7          | 3,829            | 52.1                       | 2,521          | 20.2                           | 2560        | 16.9                                     | 2230        | 16.1          | 1270        | 8.7           | 3,199       | 32.0          |    |      |      |
| 7/16  | -   | 3,751                       | 55.5          | 3,446            | 46.9                       | 2,268          | 18.1                           | 2578        | 16.7                                     | 2292        | 15.9          | 1146        | 8.4           | 2,879       | 28.8          |    |      |      |
| -   | 12  | 3,474                       | 51.4          | 3,191            | 48.5                       | 2,101          | 18.5                           | 2140        | 16.5                                     | 1860        | 15.7          | 1060        | 8.3           | 2,666       | 26.7          |    |      |      |
| 1/2   | -   | 3,282                       | 48.6          | 3,015            | 45.8                       | 1,985          | 17.5                           | 2256        | 16.5                                     | 2005        | 15.7          | 1003        | 8.3           | 2,519       | 25.2          |    |      |      |
| 5/8   | -   | 2,626                       | 38.9          | 2,412            | 36.7                       | 1,588          | 14.0                           | 1805        | 16.2                                     | 1604        | 15.7          | 802         | 8.3           | 2,015       | 20.2          |    |      |      |
| 3/4   | -   | 2,188                       | 32.4          | 2,010            | 30.6                       | 1,323          | 11.6                           | 1504        | 15.5                                     | 1337        | 15.1          | 668         | 8.0           | 1,679       | 16.8          |    |      |      |
| 1   | -   | 1,641                       | 24.3          | 1,508            | 22.9                       | 992            | 8.7                            | 1128        | 20.1                                     | 1003        | 19.3          | 501         | 7.5           | 1,260       | 12.6          |    |      |      |

1. The above milling condition is a guideline for overhang length 3D.
2. Use a rigid and precise machine and holder.
3. Please use a suitable fluid with high smoke retardant properties.
4. During dry (no fluid) milling, please use air blow to remove chips from the milling area and to eliminate chip packing.
5. Please use water-soluble coolant when machining stainless steel./6. Reduce speed and feed as well as depth of cut when high precision is required.
7. Adjust the speed and feed accordingly when the overhang length is longer than specified (refer to Parameter Reduction Chart on next page).





## List 8210 - A Brand AE-CR-VMS : 4 Flute, Multiple Lengths, Corner Radius (Continued)

## List 8215 - A Brand AE-CR-VMS : 4 Flute, Regular Length, Corner Radius (Continued)

### Slotting

| Hardness            | -   |          | Up to 30 HRC                |          | -   |          | -                          |          | -              |          | -                              |          | 30-45 HRC  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
|---------------------|---|----------|-----------------------------|----------|---|----------|----------------------------|----------|----------------|----------|--------------------------------|----------|--|----------|------|-------|---|--|----|------|--|--|---|--|----|------|---|--|----|------|---|--|----|------|
| Work Material       | Mild Steels<br>Carbon Steels<br>Cast Iron                               |          | Tool Steels<br>Alloy Steels |          | Stainless Steels  |          | Precipitation<br>Stainless |          | Titanium Alloy |          | Ni-Based Alloys<br>Inconel 718 |          | Prehardened<br>Steels<br>Hardened Steels                                 |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| Cutting Speed (SFM) | 260-395   |          | 230-360                     |          | 165-260   |          | 200-260                    |          | 165-230        |          | 65-100                         |          | 160-260  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| Depth of Cut        | <table border="1"> <tr><td>aa</td></tr> <tr><td>1.0D</td></tr> </table> |          | aa                          | 1.0D     | <table border="1"> <tr><td>Dia</td><td>aa</td></tr> <tr><td>D≤6</td><td>0.5D</td></tr> <tr><td>D&gt;6</td><td>1.0D</td></tr> </table> |          | Dia                        | aa       | D≤6            | 0.5D     | D>6                            | 1.0D     | <table border="1"> <tr><td>aa</td></tr> <tr><td>0.25D</td></tr> </table> |          | aa   | 0.25D | <table border="1"> <tr><td>aa</td></tr> <tr><td>1.0D</td></tr> </table> |  | aa | 1.0D |  |  | <table border="1"> <tr><td>aa</td></tr> <tr><td>1.0D</td></tr> </table> |  | aa | 1.0D | <table border="1"> <tr><td>aa</td></tr> <tr><td>1.0D</td></tr> </table> |  | aa | 1.0D | <table border="1"> <tr><td>aa</td></tr> <tr><td>1.0D</td></tr> </table> |  | aa | 1.0D |
| aa                  |   |          |                             |          |   |          |                            |          |                |          |                                |          |  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| 1.0D                |   |          |                             |          |   |          |                            |          |                |          |                                |          |  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| Dia                 | aa  |          |                             |          |   |          |                            |          |                |          |                                |          |  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| D≤6                 | 0.5D  |          |                             |          |   |          |                            |          |                |          |                                |          |  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| D>6                 | 1.0D  |          |                             |          |   |          |                            |          |                |          |                                |          |  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| aa                  |   |          |                             |          |   |          |                            |          |                |          |                                |          |  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| 0.25D               |   |          |                             |          |   |          |                            |          |                |          |                                |          |  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| aa                  |   |          |                             |          |   |          |                            |          |                |          |                                |          |  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| 1.0D                |   |          |                             |          |   |          |                            |          |                |          |                                |          |  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| aa                  |   |          |                             |          |   |          |                            |          |                |          |                                |          |  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| 1.0D                |   |          |                             |          |   |          |                            |          |                |          |                                |          |  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| aa                  |   |          |                             |          |   |          |                            |          |                |          |                                |          |  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| 1.0D                |   |          |                             |          |   |          |                            |          |                |          |                                |          |  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| aa                  |   |          |                             |          |   |          |                            |          |                |          |                                |          |  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| 1.0D                |   |          |                             |          |   |          |                            |          |                |          |                                |          |  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| Mill Dia.           | Speed   | Feed     | Speed                       | Feed     | Speed   | Feed     | Speed                      | Feed     | Speed          | Feed     | Speed                          | Feed     | Speed  | Feed     |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
|                     | (RPM)   | (in/min) | (RPM)                       | (in/min) | (RPM)   | (in/min) | (RPM)                      | (in/min) | (RPM)          | (in/min) | (RPM)                          | (in/min) | (RPM)  | (in/min) |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| Inch                | mm  |          |                             |          |   |          |                            |          |                |          |                                |          |  |          |      |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| -                   | 3   | 10,664   | 29.9                        | 9,695    | 23.3  | 7,433    | 14.9                       | 8540     | 16.9           | 7430     | 16.1                           | 3180     | 6.3  | 8,402    | 16.8 |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| -                   | 4   | 7,998    | 32.0                        | 7,271    | 23.3  | 5,574    | 15.6                       | 6410     | 18.1           | 5570     | 17.3                           | 2390     | 6.7  | 6,302    | 15.1 |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| 3/16                | -   | 6,718    | 26.9                        | 6,107    | 19.5  | 4,682    | 13.1                       | 5347     | 19.0           | 4679     | 18.2                           | 2005     | 7.0  | 5,293    | 12.7 |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| -                   | 5   | 6,398    | 33.3                        | 5,817    | 27.9  | 4,460    | 17.8                       | 5120     | 19.3           | 4460     | 18.5                           | 1910     | 7.1  | 5,041    | 18.1 |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| -                   | 6   | 5,332    | 40.5                        | 4,847    | 27.1  | 3,716    | 14.9                       | 4270     | 18.9           | 3710     | 18.1                           | 1590     | 7.1  | 4,201    | 23.5 |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| 1/4                 | -   | 5,038    | 38.3                        | 4,580    | 25.6  | 3,511    | 14.0                       | 4010     | 18.7           | 3509     | 17.9                           | 1504     | 7.2  | 3,969    | 22.2 |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| 5/16                | -   | 4,031    | 30.6                        | 3,664    | 20.5  | 2,809    | 11.2                       | 3208     | 17.8           | 2807     | 17.0                           | 1203     | 7.8  | 3,176    | 17.8 |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| -                   | 8   | 3,999    | 33.6                        | 3,635    | 27.6  | 2,787    | 13.4                       | 2750     | 17.7           | 2390     | 16.9                           | 1190     | 7.9  | 3,151    | 22.7 |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| 3/8                 | -   | 3,359    | 28.2                        | 3,053    | 23.2  | 2,341    | 11.2                       | 2674     | 16.8           | 2339     | 16.0                           | 1003     | 7.3  | 2,646    | 19.1 |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| -                   | 10  | 3,199    | 32.0                        | 2,908    | 25.6  | 2,230    | 12.5                       | 2200     | 16.5           | 1910     | 15.7                           | 950      | 7.1  | 2,521    | 20.2 |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| 7/16                | -   | 2,879    | 28.8                        | 2,617    | 23.0  | 2,007    | 11.2                       | 2292     | 16.5           | 2005     | 15.7                           | 859      | 7.1  | 2,268    | 18.1 |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| -                   | 12  | 2,666    | 29.9                        | 2,424    | 25.2  | 1,858    | 11.9                       | 1830     | 16.5           | 1590     | 15.7                           | 800      | 7.1  | 2,101    | 19.3 |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| 1/2                 | -   | 2,519    | 28.2                        | 2,290    | 23.8  | 1,756    | 11.2                       | 2005     | 15.4           | 1755     | 14.7                           | 752      | 6.6  | 1,985    | 18.3 |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| 5/8                 | -   | 2,015    | 22.6                        | 1,832    | 19.1  | 1,405    | 9.0                        | 1604     | 10.4           | 1404     | 10.0                           | 602      | 4.4  | 1,588    | 14.6 |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| 3/4                 | -   | 1,679    | 18.8                        | 1,527    | 15.9  | 1,170    | 7.5                        | 1337     | 10.5           | 1170     | 10.1                           | 501      | 4.6  | 1,323    | 12.2 |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |
| 1                   | -   | 1,260    | 14.1                        | 1,145    | 11.9  | 878      | 5.6                        | 1003     | 9.8            | 877      | 9.4                            | 376      | 3.5  | 992      | 9.1  |       |   |  |    |      |  |  |   |  |    |      |   |  |    |      |   |  |    |      |

1. The above milling condition is a guideline for overhang length 3D.
2. Use a rigid and precise machine and holder.
3. Please use a suitable fluid with high smoke retardant properties.
4. During dry (no fluid) milling, please use air blow to remove chips from the milling area and to eliminate chip packing.
5. Please use water-soluble coolant when machining stainless steel.
6. Reduce speed and feed as well as depth of cut when high precision is required.
7. Adjust the speed and feed accordingly when the overhang length is longer than specified (refer to Parameter Reduction Chart below).

### Parameter Reduction Chart by Length to Diameter Ratio

| Hardness      | -   |          | Up to 30 HRC                |          | 30-45 HRC                                |          | -                |          | -                          |          | -              |          | -              |          |
|---------------|---|----------|-----------------------------|----------|--|----------|------------------|----------|----------------------------|----------|----------------|----------|----------------|----------|
| Work Material | Mild Steels<br>Carbon Steels<br>Cast Iron |          | Tool Steels<br>Alloy Steels |          | Prehardened<br>Steels<br>Hardened Steels |          | Stainless Steels |          | Precipitation<br>Stainless |          | Titanium Alloy |          | Ni-Based Alloy |          |
| L/D           | Speed                                     | Feed     | Speed                       | Feed     | Speed                                    | Feed     | Speed            | Feed     | Speed                      | Feed     | Speed          | Feed     | Speed          | Feed     |
|               | (RPM)                                     | (in/min) | (RPM)                       | (in/min) | (RPM)                                    | (in/min) | (RPM)            | (in/min) | (RPM)                      | (in/min) | (RPM)          | (in/min) | (RPM)          | (in/min) |
| Slotting      | 4   | 80%      | 70%                         | 70%      | 70%                                      | 60%      | 60%              | 60%      | 60%                        | 60%      | 50%            | 50%      | 50%            | 50%      |
|               | 5   | 70%      | 60%                         | 60%      | 60%                                      | 50%      | 50%              | 50%      | 50%                        | 50%      | 50%            | 50%      | 50%            | 50%      |
| Side Milling  | 4   | 90%      | 90%                         | 80%      | 80%                                      | 70%      | 70%              | 70%      | 70%                        | 70%      | 60%            | 60%      | 60%            | 60%      |
|               | 5   | 80%      | 80%                         | 80%      | 70%                                      | 70%      | 70%              | 70%      | 70%                        | 70%      | 60%            | 60%      | 60%            | 60%      |

