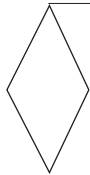








The following Star Guide™ pages enable you to select the appropriate geometry and grade along with a suggested start point for speeds and feeds by simply selecting the material to be machined and type of machining operation.

## 1st Choice



Star point will indicate the recommended insert for each material. Stellram's Star Guide™ enables you to find the right insert for your machining requirements.

- 1 **Select your material.**
- 2 **Select your machining operation from fine finishing to heavy roughing.**
- 3 **Reference our recommended geometry for the operation.**
- 4 **Reference the maximum and minimum depth of cut for this geometry.**
- 5 **Reference the maximum and minimum feed for this geometry.**
- 6 **Choose the machining condition as below:**
  - Interrupted cut 
  - Varying depth of cut 
  - Good condition 
- 7 **Reference the recommended grade and cutting speeds for this condition.**












**1**

**Material Group**

**Unalloyed Steel**

**2**

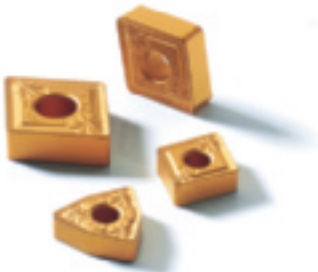
| Negative – Inserts  |                       | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing | HR<br>Heavy<br>Roughing |
|---|-----------------------|-------------------------|---------------------------|--------------------------|-------------------------|
| <br><br><br><b>6</b> | Geometry              | 3G                      | 2N                        | 4T                       | 5V                      |
|   | Grade                 | NL30                    | NL40                      | NL92                     | NL92                    |
|   | D.O.C. $a_p$ (inch)   | 0.030 - 0.140           | 0.030 - 0.155             | 0.047 - 0.250            | 0.060 - 0.315           |
|   | Feed $f_n$ (inch/rev) | 0.007 - 0.014           | 0.005 - 0.016             | 0.009 - 0.020            | 0.010 - 0.020           |
|   |                       | $V_c$ (SFM)             | 320 - 480                 | 270 - 465                | 240 - 290               |
| <br><br><br><b>6</b> | Geometry              | 3M (New)                | 2N                        | 4U                       | 5V                      |
|   | Grade                 | NL37 (New)              | NL37 (New)                | NL37 (New)               | NL37 (New)              |
|   | D.O.C. $a_p$ (inch)   | 0.030 - 0.160           | 0.030 - 0.155             | 0.050 - 0.180            | 0.060 - 0.315           |
|   | Feed $f_n$ (inch/rev) | 0.005 - 0.016           | 0.005 - 0.016             | 0.007 - 0.017            | 0.010 - 0.020           |
|   |                       | $V_c$ (SFM)             | 335 - 850                 | 335 - 850                | 335 - 850               |
| <br><br><br><b>6</b> | Geometry              | 1A                      | 3M (New)                  | 4U                       | 5V                      |
|   | Grade                 | SP4036                  | NL37 (New)                | NL37 (New)               | MP37                    |
|   | D.O.C. $a_p$ (inch)   | 0.005 - 0.100           | 0.030 - 0.160             | 0.050 - 0.180            | 0.060 - 0.315           |
|   | Feed $f_n$ (inch/rev) | 0.004 - 0.012           | 0.005 - 0.016             | 0.007 - 0.017            | 0.010 - 0.020           |
|   |                       | $V_c$ (SFM)             | 430 - 1400                | 335 - 1400               | 480 - 800               |

**3**

**4**

**5**

**7**



# Machining Materials

8 star points represent each main group of machinable materials. Each segment has been color coded to identify the material group.

**Unalloyed Steels**

**Alloyed Steels**

**Stainless Steels**

**PH Stainless**

**Cast Irons**

**Aluminum & Alloys**

**High Temperature Alloys**

**Hard Materials (52-56 HRC)**

**P**

**M**

**K**

**N**

**S**

**H**

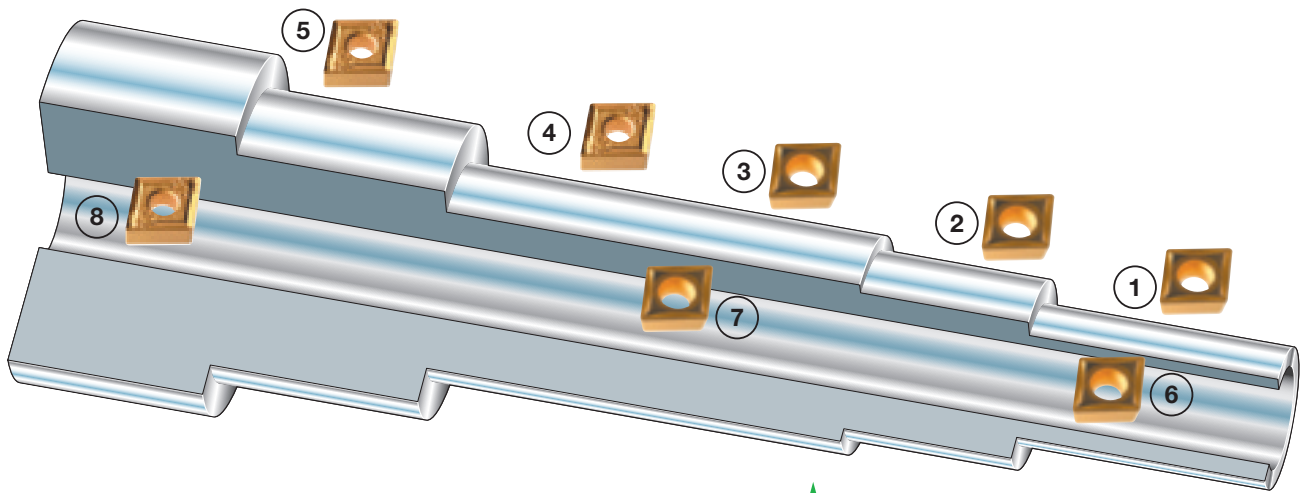
## Star Guide

## Key to Recommended Inserts

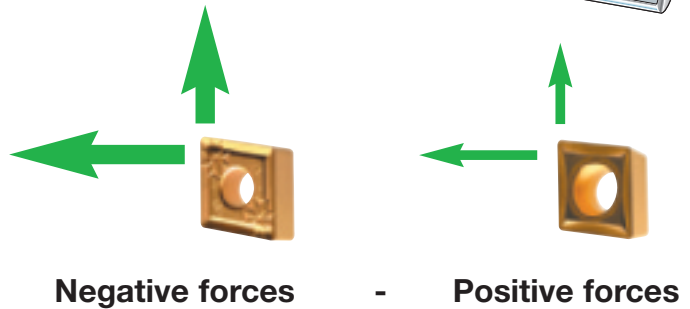
|  |   | Material Designations |   |                  |   |                   |   |                   |
|--|---|-----------------------|---|------------------|---|-------------------|---|-------------------|
|  | P | Unalloyed Steels      | M | Stainless Steels | K | Cast Irons        | S | High Temp. Alloys |
|  | P | Alloyed Steels        | M | PH Stainless     | N | Aluminum & Alloys | H | Hard Materials    |



# Negative Vs Positive



Given the same machining conditions, one of the important differences between positive and negative inserts are the cutting forces generated.



## External and Internal Machining

| External Machining |  |                          |                     |
|--------------------|--|--------------------------|---------------------|
|                    | Applications   | Recommendations          | Insert Types        |
| 1                  | Long and slender component (risk of deformation and vibration), unstable machining (risk of vibration) | Positive inserts 7°, 11° | C, D, E, S, T, W    |
| 2, 3               | Long unstable component (risk of vibration).   | Positive insert 7°       | C, D, E, S, T, W    |
| 4, 5               | Medium - High stability of components  | Negative insert          | C, D, R, S, T, V, W |

### Other considerations

Fine finishing: When machining at very small depths of cut to obtain good surface finishes and or very precise tolerances, positive inserts are recommended.

| Internal Machining  |   |                      |                     |
|---|---|----------------------|---------------------|
| The side clearance of positive inserts allows for machining of small diameters. |   |                      |                     |
|   | Application   | Recommendations      | Insert Types        |
| 6   | For small internal diameter with long overhangs (0.300" - 1.250") | Positive inserts 11° | E, T                |
| 7   | For small to medium diameter and long overhangs (0.625" - 2.375") | Positive inserts 7°  | C, D, E, S, T, W    |
| 8   | For larger bore with stable condition                             | Negative inserts     | C, D, R, S, T, V, W |



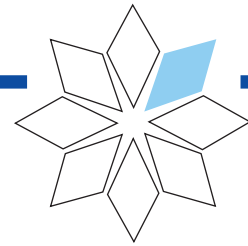
| Negative – Inserts |  | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing | HR<br>Heavy<br>Roughing |               |
|--------------------|--|-------------------------|---------------------------|--------------------------|-------------------------|---------------|
| P                  |  | Geometry                | 3G                        | 2N                       | 4T                      | 5V            |
|                    |  | Grade                   | NL30                      | NL40                     | NL92                    | NL92          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.030 - 0.140             | 0.030 - 0.155            | 0.047 - 0.250           | 0.060 - 0.315 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.007 - 0.014             | 0.005 - 0.016            | 0.009 - 0.020           | 0.010 - 0.020 |
|                    |  | $V_c$ (SFM)             | 320 - 480                 | 270 - 465                | 240 - 290               | 240 - 290     |
|                    |  | Geometry                | 3M (New)                  | 2N                       | 4U                      | 5V            |
|                    |  | Grade                   | NL37 (New)                | NL37 (New)               | NL37 (New)              | NL37 (New)    |
|                    |  | D.O.C. $a_p$ (inch)     | 0.030 - 0.160             | 0.030 - 0.155            | 0.050 - 0.180           | 0.060 - 0.315 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.005 - 0.016             | 0.005 - 0.016            | 0.007 - 0.017           | 0.010 - 0.020 |
|                    |  | $V_c$ (SFM)             | 335 - 850                 | 335 - 850                | 335 - 850               | 335 - 850     |
|                    |  | Geometry                | 1A                        | 3M (New)                 | 4U                      | 5V            |
|                    |  | Grade                   | SP4036                    | NL37 (New)               | NL37 (New)              | MP37          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.005 - 0.100             | 0.030 - 0.160            | 0.050 - 0.180           | 0.060 - 0.315 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.004 - 0.012             | 0.005 - 0.016            | 0.007 - 0.017           | 0.010 - 0.020 |
|                    |  | $V_c$ (SFM)             | 430 - 1400                | 335 - 1400               | 335 - 1400              | 480 - 800     |

| Positive – Inserts |  | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing |               |
|--------------------|--|-------------------------|---------------------------|--------------------------|---------------|
| P                  |  | Geometry                | 62                        | 73                       | 3G            |
|                    |  | Grade                   | SP4036                    | NL30                     | NL92          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | 0.016 - 0.200            | 0.020 - 0.200 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | 0.003 - 0.020            | 0.006 - 0.020 |
|                    |  | $V_c$ (SFM)             | 430 - 800                 | 320 - 480                | 240 - 290     |
|                    |  | Geometry                | 62                        | 73                       | 3G            |
|                    |  | Grade                   | SP4036                    | NL30                     | NL30          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | 0.016 - 0.200            | 0.020 - 0.200 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | 0.003 - 0.020            | 0.006 - 0.020 |
|                    |  | $V_c$ (SFM)             | 430 - 1120                | 320 - 730                | 320 - 730     |
|                    |  | Geometry                | 62                        | 73                       | 3G            |
|                    |  | Grade                   | SP4036                    | NL25                     | NL25          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | 0.016 - 0.200            | 0.020 - 0.200 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | 0.003 - 0.020            | 0.006 - 0.020 |
|                    |  | $V_c$ (SFM)             | 430 - 1410                | 330 - 1300               | 330 - 1300    |

See materials cross reference chart, pages 260 - 261.

# Material Group

## Alloyed Steel



| Negative – Inserts |  | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing | HR<br>Heavy<br>Roughing |               |
|--------------------|--|-------------------------|---------------------------|--------------------------|-------------------------|---------------|
| P                  |  | Geometry                | 2N                        | 2N                       | 4T                      | 5V            |
|                    |  | Grade                   | NL37 (New)                | NL92                     | NL92                    | NL92          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.030 - 0.155             | 0.030 - 0.155            | 0.047 - 0.250           | 0.060 - 0.315 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.005 - 0.016             | 0.005 - 0.016            | 0.009 - 0.020           | 0.012 - 0.020 |
|                    |  | $V_c$ (SFM)             | 190 - 330                 | 145 - 175                | 145 - 175               | 145 - 175     |
|                    |  | Geometry                | 3M (New)                  | 2N                       | 4T                      | 5V            |
|                    |  | Grade                   | NL37 (New)                | NL30                     | NL40                    | NL92          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.030 - 0.160             | 0.030 - 0.155            | 0.047 - 0.250           | 0.060 - 0.315 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.005 - 0.016             | 0.005 - 0.016            | 0.009 - 0.020           | 0.012 - 0.020 |
|                    |  | $V_c$ (SFM)             | 190 - 495                 | 190 - 450                | 165 - 425               | 145 - 300     |
|                    |  | Geometry                | 1A                        | 3M (New)                 | 4U                      | 5V            |
|                    |  | Grade                   | SP3036                    | NL37 (New)               | NL37 (New)              | NL92          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.005 - 0.100             | 0.030 - 0.160            | 0.050 - 0.180           | 0.060 - 0.315 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.004 - 0.012             | 0.005 - 0.016            | 0.007 - 0.017           | 0.012 - 0.020 |
|                    |  | $V_c$ (SFM)             | 240 - 815                 | 190 - 825                | 190 - 825               | 145 - 430     |

| Positive – Inserts |  | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing |               |
|--------------------|--|-------------------------|---------------------------|--------------------------|---------------|
| P                  |  | Geometry                | 62                        | 73                       | 3G            |
|                    |  | Grade                   | SP4036                    | NL40                     | NL92          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | 0.016 - 0.200            | 0.020 - 0.200 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | 0.003 - 0.020            | 0.006 - 0.020 |
|                    |  | $V_c$ (SFM)             | 400 - 510                 | 190 - 320                | 190 - 300     |
|                    |  | Geometry                | 62                        | 73                       | 3G            |
|                    |  | Grade                   | SP4036                    | NL30                     | NL30          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | 0.016 - 0.200            | 0.020 - 0.200 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | 0.003 - 0.020            | 0.006 - 0.020 |
|                    |  | $V_c$ (SFM)             | 400 - 640                 | 190 - 450                | 190 - 450     |
|                    |  | Geometry                | 62                        | 73                       | 3G            |
|                    |  | Grade                   | SP4036                    | NL25                     | NL25          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | 0.016 - 0.200            | 0.020 - 0.200 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | 0.003 - 0.020            | 0.006 - 0.020 |
|                    |  | $V_c$ (SFM)             | 400 - 850                 | 190 - 770                | 190 - 770     |

See materials cross reference chart, pages 260 - 261.





# Material Group

## Stainless steel 300 - 400

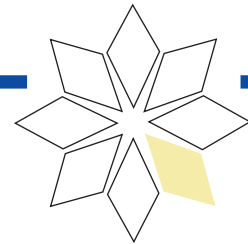
| Negative – Inserts |  | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing | HR<br>Heavy<br>Roughing |               |
|--------------------|--|-------------------------|---------------------------|--------------------------|-------------------------|---------------|
|                    |  | Geometry                | 1A                        | 3J                       | 2N                      | 4T            |
|                    |  | Grade                   | NL30                      | NL40                     | NL92                    | NL92          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.030 - 0.100             | 0.050 - 0.100            | 0.040 - 0.155           | 0.047 - 0.200 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.004 - 0.012             | 0.005 - 0.014            | 0.005 - 0.016           | 0.009 - 0.020 |
|                    |  | $V_c$ (SFM)             | 320 - 400                 | 290 - 335                | 255 - 320               | 140 - 155     |
|                    |  | Geometry                | 1A                        | 3J                       | 2N                      | 4T            |
|                    |  | Grade                   | NL25                      | NL30                     | NL30                    | NL40          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.030 - 0.100             | 0.050 - 0.100            | 0.040 - 0.155           | 0.047 - 0.200 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.004 - 0.012             | 0.005 - 0.014            | 0.005 - 0.016           | 0.009 - 0.020 |
|                    |  | $V_c$ (SFM)             | 350 - 545                 | 350 - 450                | 350 - 450               | 415 - 510     |
|                    |  | Geometry                | 1A                        | 3J                       | 2N                      | 4T            |
|                    |  | Grade                   | SP4036                    | SP3036                   | NL25                    | NL30          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.030 - 0.100             | 0.050 - 0.100            | 0.040 - 0.155           | 0.047 - 0.200 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.004 - 0.012             | 0.005 - 0.014            | 0.005 - 0.016           | 0.009 - 0.020 |
|                    |  | $V_c$ (SFM)             | 430 - 960                 | 430 - 960                | 350 - 910               | 350 - 770     |

| Positive – Inserts |  | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing |               |
|--------------------|--|-------------------------|---------------------------|--------------------------|---------------|
|                    |  | Geometry                | 62                        | 73                       | -             |
|                    |  | Grade                   | SP4036                    | NL30                     | -             |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | 0.016 - 0.200            | -             |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | 0.003 - 0.020            | -             |
|                    |  | $V_c$ (SFM)             | 430 - 575                 | 320 - 400                | -             |
|                    |  | Geometry                | 62                        | 73                       | 73            |
|                    |  | Grade                   | SP4036                    | NL30                     | NL30          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | 0.016 - 0.200            | 0.020 - 0.200 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | 0.003 - 0.020            | 0.003 - 0.020 |
|                    |  | $V_c$ (SFM)             | 430 - 770                 | 350 - 450                | 350 - 450     |
|                    |  | Geometry                | 62                        | 73                       | 73            |
|                    |  | Grade                   | SP4036                    | NL25                     | NL25          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | 0.016 - 0.200            | 0.020 - 0.200 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | 0.003 - 0.020            | 0.003 - 0.020 |
|                    |  | $V_c$ (SFM)             | 430 - 960                 | 350 - 910                | 350 - 910     |

See materials cross reference chart, pages 262 - 263.

# Material Group

## Stainless Steel PH

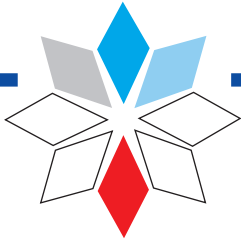


| Negative – Inserts |  | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing | HR<br>Heavy<br>Roughing |               |
|--------------------|--|-------------------------|---------------------------|--------------------------|-------------------------|---------------|
| <b>M</b>           |  | Geometry                | 2N                        | 3J                       | 2N                      | 4M            |
|                    |  | Grade                   | NL30                      | NL40                     | NL40                    | NL92          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.040 - 0.240             | 0.047 - 0.100            | 0.040 - 0.155           | 0.047 - 0.275 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.008 - 0.016             | 0.005 - 0.014            | 0.005 - 0.016           | 0.012 - 0.020 |
|                    |  | $V_c$ (SFM)             | 185 - 215                 | 160 - 190                | 160 - 190               | 130 - 160     |
|                    |  | Geometry                | 3F                        | 91                       | 2N                      | 4M            |
|                    |  | Grade                   | SP3064                    | SP3064                   | NL30                    | NL30          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.040 - 0.120             | 0.050 - 0.230            | 0.040 - 0.155           | 0.047 - 0.275 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.008 - 0.014             | 0.006 - 0.015            | 0.005 - 0.016           | 0.012 - 0.020 |
|                    |  | $V_c$ (SFM)             | 240 - 300                 | 240 - 300                | 160 - 255               | 190 - 240     |
|                    |  | Geometry                | 3F                        | 91                       | 2N                      | 4M            |
|                    |  | Grade                   | SP4064                    | SP0864                   | SP0864                  | NL25          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.040 - 0.120             | 0.050 - 0.230            | 0.040 - 0.240           | 0.047 - 0.275 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.008 - 0.014             | 0.006 - 0.015            | 0.008 - 0.016           | 0.012 - 0.020 |
|                    |  | $V_c$ (SFM)             | 250 - 535                 | 250 - 535                | 250 - 535               | 240 - 465     |

| Positive – Inserts |  | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing |   |
|--------------------|--|-------------------------|---------------------------|--------------------------|---|
| <b>M</b>           |  | Geometry                | 62                        | 73                       | - |
|                    |  | Grade                   | SP4036                    | NL92                     | - |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | 0.020 - 0.200            | - |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | 0.003 - 0.020            | - |
|                    |  | $V_c$ (SFM)             | 240 - 200                 | 130 - 225                | - |
|                    |  | Geometry                | 62                        | 73                       | - |
|                    |  | Grade                   | SP4036                    | SFZ                      | - |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | 0.020 - 0.200            | - |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | 0.003 - 0.020            | - |
|                    |  | $V_c$ (SFM)             | 240 - 305                 | 160 - 270                | - |
|                    |  | Geometry                | 62                        | 73                       | - |
|                    |  | Grade                   | SP4036                    | NL25                     | - |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | 0.020 - 0.200            | - |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | 0.003 - 0.020            | - |
|                    |  | $V_c$ (SFM)             | 240 - 510                 | 190 - 465                | - |

See materials cross reference chart, pages 262 - 263.





| Negative – Inserts |  | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing | HR<br>Heavy<br>Roughing |               |
|--------------------|--|-------------------------|---------------------------|--------------------------|-------------------------|---------------|
|                    |  | Geometry                | 4U                        | 4U                       | 4T                      | FLAT          |
|                    |  | Grade                   | SC1519                    | SC1519                   | MP37                    | MP37          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.020 - 0.160             | 0.020 - 0.160            | 0.047 - 0.255           | 0.050 - 0.235 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.004 - 0.016             | 0.004 - 0.016            | 0.009 - 0.020           | 0.012 - 0.025 |
|                    |  | $V_c$ (SFM)             | 400 - 625                 | 400 - 625                | 480 - 575               | 480 - 575     |
|                    |  | Geometry                | 4U                        | 4U                       | 4T                      | FLAT          |
|                    |  | Grade                   | SC1519                    | SC1519                   | MP37                    | SC1519        |
|                    |  | D.O.C. $a_p$ (inch)     | 0.020 - 0.160             | 0.020 - 0.160            | 0.047 - 0.255           | 0.050 - 0.235 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.004 - 0.016             | 0.004 - 0.016            | 0.009 - 0.020           | 0.012 - 0.025 |
|                    |  | $V_c$ (SFM)             | 400 - 625                 | 400 - 625                | 290 - 640               | 400 - 945     |
|                    |  | Geometry                | 4U                        | 4U                       | 4T                      | FLAT          |
|                    |  | Grade                   | SC1519                    | SC1519                   | NL25                    | SC1519        |
|                    |  | D.O.C. $a_p$ (inch)     | 0.020 - 0.160             | 0.020 - 0.160            | 0.047 - 0.255           | 0.050 - 0.235 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.004 - 0.016             | 0.004 - 0.016            | 0.009 - 0.020           | 0.012 - 0.025 |
|                    |  | $V_c$ (SFM)             | 400 - 625                 | 400 - 625                | 290 - 1070              | 400 - 1570    |

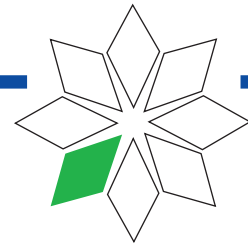
| Positive – Inserts |  | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing |               |
|--------------------|--|-------------------------|---------------------------|--------------------------|---------------|
|                    |  | Geometry                | -                         | -                        | -             |
|                    |  | Grade                   | -                         | -                        | -             |
|                    |  | D.O.C. $a_p$ (inch)     | -                         | -                        | -             |
|                    |  | Feed $f_n$ (inch/rev)   | -                         | -                        | -             |
|                    |  | $V_c$ (SFM)             | -                         | -                        | -             |
|                    |  | Geometry                | 62                        | T                        | 3G            |
|                    |  | Grade                   | GH2                       | GH1                      | MP37          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | 0.040 - 0.235            | 0.020 - 0.160 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | 0.008 - 0.020            | 0.004 - 0.014 |
|                    |  | $V_c$ (SFM)             | 305 - 400                 | 225 - 510                | 500 - 650     |
|                    |  | Geometry                | 62                        | T                        | 3G            |
|                    |  | Grade                   | GH2                       | GH1                      | MP37          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | 0.040 - 0.235            | 0.020 - 0.160 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | 0.008 - 0.020            | 0.004 - 0.014 |
|                    |  | $V_c$ (SFM)             | 305 - 560                 | 225 - 720                | 500 - 800     |

See materials cross reference chart, pages 264 - 265.



# Material Group

## Aluminum & Alloys



| Negative – Inserts |  | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing | HR<br>Heavy<br>Roughing |   |
|--------------------|--|-------------------------|---------------------------|--------------------------|-------------------------|---|
| N                  |  | Geometry                | -                         | -                        | -                       | - |
|                    |  | Grade                   | -                         | -                        | -                       | - |
|                    |  | D.O.C. $a_p$ (inch)     | -                         | -                        | -                       | - |
|                    |  | Feed $f_n$ (inch/rev)   | -                         | -                        | -                       | - |
|                    |  | $V_c$ (SFM)             | -                         | -                        | -                       | - |
|                    |  | Geometry                | -                         | 3F                       | 3F                      | - |
|                    |  | Grade                   | -                         | SP0864                   | SP0864                  | - |
|                    |  | D.O.C. $a_p$ (inch)     | -                         | 0.040 - 0.120            | 0.040 - 0.120           | - |
|                    |  | Feed $f_n$ (inch/rev)   | -                         | 0.008 - 0.014            | 0.008 - 0.014           | - |
|                    |  | $V_c$ (SFM)             | -                         | 1170 - 1870              | 1170 - 1870             | - |
|                    |  | Geometry                | -                         | 3F                       | 3F                      | - |
|                    |  | Grade                   | -                         | SP0864                   | SP0864                  | - |
|                    |  | D.O.C. $a_p$ (inch)     | -                         | 0.040 - 0.120            | 0.040 - 0.120           | - |
|                    |  | Feed $f_n$ (inch/rev)   | -                         | 0.008 - 0.014            | 0.008 - 0.014           | - |
|                    |  | $V_c$ (SFM)             | -                         | 1170 - 3400              | 1170 - 3400             | - |

| Positive – Inserts |  | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing |               |
|--------------------|--|-------------------------|---------------------------|--------------------------|---------------|
| N                  |  | Geometry                | -                         | 64                       | 64            |
|                    |  | Grade                   | -                         | GH1                      | GH1           |
|                    |  | D.O.C. $a_p$ (inch)     | -                         | 0.080 - 0.235            | 0.080 - 0.235 |
|                    |  | Feed $f_n$ (inch/rev)   | -                         | 0.014 - 0.025            | 0.014 - 0.025 |
|                    |  | $V_c$ (SFM)             | -                         | 590 - 1070               | 590 - 1070    |
|                    |  | Geometry                | 15                        | 64                       | 64            |
|                    |  | Grade                   | GH1                       | GH1                      | GH1           |
|                    |  | D.O.C. $a_p$ (inch)     | 0.030 - 0.080             | 0.080 - 0.235            | 0.080 - 0.235 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.002 - 0.008             | 0.014 - 0.025            | 0.014 - 0.025 |
|                    |  | $V_c$ (SFM)             | 590 - 1570                | 590 - 1570               | 590 - 1570    |
|                    |  | Geometry                | 15                        | 64                       | 64            |
|                    |  | Grade                   | GH1                       | GH1                      | GH1           |
|                    |  | D.O.C. $a_p$ (inch)     | 0.030 - 0.080             | 0.080 - 0.235            | 0.080 - 0.235 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.002 - 0.008             | 0.014 - 0.025            | 0.014 - 0.025 |
|                    |  | $V_c$ (SFM)             | 590 - 2625                | 590 - 2625               | 590 - 2625    |

See materials cross reference chart, pages 264 - 265.





# Material Group

## High Temperature Alloys

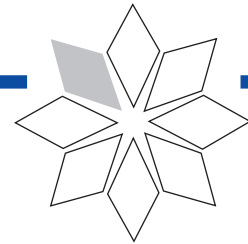
| Negative – Inserts |  | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing | HR<br>Heavy<br>Roughing |               |
|--------------------|--|-------------------------|---------------------------|--------------------------|-------------------------|---------------|
| S                  |  | Geometry                | 2N                        | 91                       | 2N                      | 4M            |
|                    |  | Grade                   | SP0864                    | SP3064                   | NL92                    | NL30          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.040 - 0.240             | 0.050 - 0.230            | 0.040 - 0.240           | 0.040 - 0.200 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.008 - 0.016             | 0.006 - 0.015            | 0.008 - 0.016           | 0.012 - 0.020 |
|                    |  | $V_c$ (SFM)             | 80 - 120                  | 85 - 120                 | 50 - 100                | 65 - 100      |
|                    |  | Geometry                | 3F                        | 91                       | 2N                      | 4M            |
|                    |  | Grade                   | SP3064                    | SP3064                   | SP0864                  | NL30          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.040 - 0.120             | 0.050 - 0.230            | 0.040 - 0.240           | 0.040 - 0.200 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.005 - 0.014             | 0.006 - 0.015            | 0.008 - 0.016           | 0.012 - 0.020 |
|                    |  | $V_c$ (SFM)             | 80 - 170                  | 80 - 170                 | 90 - 120                | 65 - 140      |
|                    |  | Geometry                | 1A                        | 3F                       | 2N                      | 4M            |
|                    |  | Grade                   | SP4036                    | SP0864                   | SP0864                  | NL30          |
|                    |  | D.O.C. $a_p$ (inch)     | 0.005 - 0.100             | 0.040 - 0.120            | 0.040 - 0.240           | 0.040 - 0.200 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.004 - 0.012             | 0.005 - 0.014            | 0.008 - 0.016           | 0.012 - 0.020 |
|                    |  | $V_c$ (SFM)             | 80 - 290                  | 80 - 295                 | 90 - 295                | 65 - 225      |

| Positive – Inserts |  | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing |               |
|--------------------|--|-------------------------|---------------------------|--------------------------|---------------|
| S                  |  | Geometry                | 62                        | -                        | -             |
|                    |  | Grade                   | GH2                       | -                        | -             |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | -                        | -             |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | -                        | -             |
|                    |  | $V_c$ (SFM)             | 50 - 95                   | -                        | -             |
|                    |  | Geometry                | 62                        | M                        | 73            |
|                    |  | Grade                   | SP4036                    | GH1                      | SFZ           |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | 0.020 - 0.155            | 0.020 - 0.200 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | 0.004 - 0.008            | 0.003 - 0.020 |
|                    |  | $V_c$ (SFM)             | 80 - 190                  | 65 - 130                 | 50 - 110      |
|                    |  | Geometry                | 62                        | M                        | 73            |
|                    |  | Grade                   | SP4036                    | GH1                      | SFZ           |
|                    |  | D.O.C. $a_p$ (inch)     | 0.010 - 0.120             | 0.020 - 0.155            | 0.020 - 0.200 |
|                    |  | Feed $f_n$ (inch/rev)   | 0.001 - 0.010             | 0.004 - 0.008            | 0.003 - 0.020 |
|                    |  | $V_c$ (SFM)             | 80 - 290                  | 65 - 255                 | 50 - 175      |

See materials cross reference chart, pages 266 - 273.

# Material Group

## Hard Materials



| Negative – Inserts |  | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing | HR<br>Heavy<br>Roughing |   |
|--------------------|--|-------------------------|---------------------------|--------------------------|-------------------------|---|
| H                  |  | Geometry                | 4U                        | 4T                       | 4T                      | - |
|                    |  | Grade                   | NL37 (New)                | NL37 (New)               | NL37 (New)              | - |
|                    |  | D.O.C. $a_p$ (inch)     | 0.050 - 0.180             | 0.047 - 0.250            | 0.047 - 0.250           | - |
|                    |  | Feed $f_n$ (inch/rev)   | 0.007 - 0.017             | 0.008 - 0.016            | 0.008 - 0.016           | - |
|                    |  | $V_c$ (SFM)             | 100 - 135                 | 100 - 135                | 100 - 135               | - |
|                    |  | Geometry                | 2N                        | 4U                       | 4U                      | - |
|                    |  | Grade                   | NL37 (New)                | NL37 (New)               | NL37 (New)              | - |
|                    |  | D.O.C. $a_p$ (inch)     | 0.040 - 0.160             | 0.050 - 0.180            | 0.050 - 0.180           | - |
|                    |  | Feed $f_n$ (inch/rev)   | 0.005 - 0.016             | 0.007 - 0.017            | 0.007 - 0.017           | - |
|                    |  | $V_c$ (SFM)             | 150 - 175                 | 150 - 175                | 150 - 175               | - |
|                    |  | Geometry                | 1A                        | 2N                       | 2N                      | - |
|                    |  | Grade                   | SP4036                    | SP0864                   | SP0864                  | - |
|                    |  | D.O.C. $a_p$ (inch)     | 0.005 - 0.100             | 0.030 - 0.155            | 0.030 - 0.155           | - |
|                    |  | Feed $f_n$ (inch/rev)   | 0.004 - 0.012             | 0.005 - 0.016            | 0.005 - 0.016           | - |
|                    |  | $V_c$ (SFM)             | 155 - 420                 | 200 - 440                | 200 - 440               | - |

| Positive – Inserts |  | FF<br>Fine<br>Finishing | MF<br>Medium<br>Finishing | MR<br>Medium<br>Roughing |   |
|--------------------|--|-------------------------|---------------------------|--------------------------|---|
| H                  |  | Geometry                | -                         | -                        | - |
|                    |  | Grade                   | -                         | -                        | - |
|                    |  | D.O.C. $a_p$ (inch)     | -                         | -                        | - |
|                    |  | Feed $f_n$ (inch/rev)   | -                         | -                        | - |
|                    |  | $V_c$ (SFM)             | -                         | -                        | - |
|                    |  | Geometry                | -                         | -                        | - |
|                    |  | Grade                   | *SA7402                   | *SA7402                  | - |
|                    |  | D.O.C. $a_p$ (inch)     | -                         | -                        | - |
|                    |  | Feed $f_n$ (inch/rev)   | -                         | -                        | - |
|                    |  | $V_c$ (SFM)             | 65 - 280                  | 65 - 260                 | - |
|                    |  | Geometry                | -                         | -                        | - |
|                    |  | Grade                   | *SA7402                   | *SA7402                  | - |
|                    |  | D.O.C. $a_p$ (inch)     | -                         | -                        | - |
|                    |  | Feed $f_n$ (inch/rev)   | -                         | -                        | - |
|                    |  | $V_c$ (SFM)             | 65 - 280                  | 65 - 260                 | - |



\* For the SA grade information, please refer to pages 32 - 33 and the Stellram Ceramic Catalog.



# Cutting Speed (Vc) SFM

| Cutting Speed (Vc) SFM |                         |  | CVD Coated        |     |                   |     |                   |     |                   |     |                   |     |                     |     |                   |     |
|------------------------|-------------------------|--|-------------------|-----|-------------------|-----|-------------------|-----|-------------------|-----|-------------------|-----|---------------------|-----|-------------------|-----|
| ISO                    | Material                | Rm and Hardness                                | NL25<br>Max - Min |     | NL30<br>Max - Min |     | NL37<br>Max - Min |     | NL40<br>Max - Min |     | NL92<br>Max - Min |     | SC1519<br>Max - Min |     | MP37<br>Max - Min |     |
| P                      | Unalloyed Steels        | <600 N/mm <sup>2</sup><br><180HBN              | 1335              | 535 | 1250              | 520 | 1400              | 520 | 1185              | 445 | 740               | 385 | -                   | -   | 1600              | 900 |
|                        |                         | <950 N/mm <sup>2</sup><br><280HBN              | 865               | 345 | 800               | 335 | 900               | 335 | 770               | 290 | 480               | 250 | -                   | -   | 1100              | 500 |
|                        | Alloyed Steels          | 700-950 N/mm <sup>2</sup><br>200-280 HBN       | 790               | 315 | 750               | 308 | 825               | 310 | 705               | 265 | 440               | 230 | -                   | -   | 700               | 400 |
|                        |                         | 950 - 1200 N/mm <sup>2</sup><br>280 - 355 HBN  | 720               | 290 | 660               | 280 | 700               | 280 | 640               | 240 | 400               | 210 | -                   | -   | -                 | -   |
|                        |                         | 1200 - 1400 N/mm <sup>2</sup><br>355 - 415 HBN | 490               | 195 | 440               | 190 | 400               | 190 | 435               | 165 | 275               | 140 | -                   | -   | -                 | -   |
| M                      | Stainless Steels        | Austenitic + Ferritic<br>300 series            | 900               | 360 | 750               | 350 | -                 | -   | 800               | 300 | 500               | 260 | -                   | -   | 600               | 425 |
|                        |                         | Martensitic<br>400 series                      | 935               | 375 | 780               | 365 | -                 | -   | 832               | 310 | 520               | 270 | -                   | -   | 650               | 400 |
|                        |                         | Refractory<br>P.H.                             | 480               | 190 | 400               | 185 | -                 | -   | 430               | 160 | 265               | 140 | -                   | -   | 500               | 330 |
| K                      | Cast Irons              | Grey<br>GG-Ft                                  | 1320              | 530 | 1100              | 515 | -                 | -   | -                 | -   | 735               | 380 | 1615                | 705 | 600               | 500 |
|                        |                         | Spheroidal-Ductile<br>GGG-FGS                  | 1140              | 455 | 950               | 445 | -                 | -   | -                 | -   | 635               | 330 | 1395                | 610 | 900               | 550 |
|                        |                         | Malleable<br>GTS - MN/MP                       | 770               | 305 | 640               | 290 | -                 | -   | -                 | -   | 425               | 220 | 940                 | 410 | -                 | -   |
| N                      | Aluminum & Alloys       | < 16% Si 116HBN                                | 1560              | 625 | -                 | -   | -                 | -   | -                 | -   | -                 | -   | -                   | -   | -                 | -   |
|                        |                         | > 16% Si 92HBN                                 | 960               | 385 | -                 | -   | -                 | -   | -                 | -   | -                 | -   | -                   | -   | -                 | -   |
| S                      | High Temperature Alloys | Iron Based                                     | 190               | 75  | 160               | 75  | -                 | -   | 170               | 65  | 105               | 55  | -                   | -   | -                 | -   |
|                        |                         | Cobalt Based                                   | 155               | 60  | 130               | 60  | -                 | -   | 140               | 50  | 85                | 45  | -                   | -   | -                 | -   |
|                        |                         | Nickel Based                                   | 170               | 65  | 140               | 65  | -                 | -   | 150               | 55  | 95                | 50  | -                   | -   | -                 | -   |
|                        |                         | Titanium Based                                 | 265               | 105 | 220               | 105 | -                 | -   | 235               | 90  | 145               | 75  | -                   | -   | -                 | -   |
| H                      | Hard Steel              | >1400 N/mm <sup>2</sup><br>>415 HBN            | -                 | -   | -                 | -   | 220               | 155 | -                 | -   | -                 | -   | -                   | -   | -                 | -   |
|                        | Chilled Cast Iron       | 1400 N/mm <sup>2</sup><br>400 HBN              | -                 | -   | -                 | -   | 200               | 150 | -                 | -   | -                 | -   | -                   | -   | -                 | -   |

## Star Guide Key to Recommended Inserts






| Material Designations   |                   |   |                   |
|---|-------------------|---|-------------------|
|    | Unalloyed Steels  |    | Stainless Steels  |
|  | Cast Irons        |  | High Temp. Alloys |
|    | Alloyed Steels    |    | PH Stainless      |
|  | Aluminum & Alloys |  | Hard Materials    |

# Cutting Speed (Vc) SFM

| Cutting Speed (Vc) SFM |                         |  | PVD Coated          |      |                               |      |                               |      |                  |      | Uncoated         |      |                                |      |                                |     |
|------------------------|-------------------------|--|---------------------|------|-------------------------------|------|-------------------------------|------|------------------|------|------------------|------|--------------------------------|------|--------------------------------|-----|
| ISO                    | Material                | Rm and Hardness                                | SP0864<br>Max - Min |      | SP4036<br>SP4064<br>Max - Min |      | SP3036<br>SP3064<br>Max - Min |      | SFZ<br>Max - Min |      | H21<br>Max - Min |      | GH1<br>micrograin<br>Max - Min |      | GH2<br>micrograin<br>Max - Min |     |
| P                      | Unalloyed Steels        | <600 N/mm <sup>2</sup><br><180HBN              | -                   | -    | 1450                          | 680  | 1405                          | 665  | 480              | 255  | -                | -    | -                              | -    | -                              | -   |
|                        |                         | <950 N/mm <sup>2</sup><br><280HBN              | -                   | -    | 940                           | 440  | 910                           | 435  | -                | -    | -                | -    | -                              | -    | -                              | -   |
|                        | Alloyed Steels          | 700 - 950 N/mm <sup>2</sup><br>200 - 280 HBN   | -                   | -    | 860                           | 405  | 835                           | 395  | -                | -    | -                | -    | -                              | -    | -                              | -   |
|                        |                         | 950 - 1200 N/mm <sup>2</sup><br>280 - 355 HBN  | -                   | -    | -                             | -    | 760                           | 360  | -                | -    | -                | -    | -                              | -    | -                              | -   |
|                        |                         | 1200 - 1400 N/mm <sup>2</sup><br>355 - 415 HBN | -                   | -    | -                             | -    | 520                           | 245  | -                | -    | -                | -    | -                              | -    | -                              | -   |
| M                      | Stainless Steels        | Austenitic + Ferritic<br>300 series            | 1000                | 470  | 980                           | 460  | 950                           | 450  | -                | -    | 450              | 260  | 500                            | 260  | 455                            | 250 |
|                        |                         | Martensitic<br>400 series                      | 1040                | 490  | 100                           | 480  | 990                           | 470  | -                | -    | -                | -    | 520                            | 270  | -                              | -   |
|                        |                         | Refractory<br>P.H.                             | 535                 | 250  | 325                           | 245  | 505                           | 240  | 320              | 160  | 240              | 140  | 265                            | 140  | 245                            | 135 |
| K                      | Cast Irons              | Grey<br>GG-Ft                                  | 1465                | 690  | 1435                          | 675  | 1395                          | 660  | -                | -    | 660              | 380  | 735                            | 380  | -                              | -   |
|                        |                         | Spheroidal-Ductile<br>GGG-FGS                  | 1265                | 595  | 1240                          | 585  | 1205                          | 570  | -                | -    | 570              | 330  | 635                            | 330  | 575                            | 320 |
|                        |                         | Malleable<br>GTS - MN/MP                       | 855                 | 400  | 835                           | 395  | 810                           | 385  | -                | -    | 385              | 220  | 430                            | 225  | -                              | -   |
| N                      | Aluminum & Alloys       | < 16% Si 116HBN                                | 3500                | 1200 | 3200                          | 1200 | 3150                          | 1200 | 3000             | 1200 | 1500             | 1000 | 2700                           | 1100 | -                              | -   |
|                        |                         | > 16% Si 92HBN                                 | -                   | -    | -                             | -    | -                             | -    | 2000             | 800  | 700              | 500  | 1800                           | 600  | -                              | -   |
| S                      | High Temperature Alloys | Iron Based                                     | 215                 | 100  | 210                           | 100  | 205                           | 95   | 130              | 65   | 95               | 55   | 105                            | 55   | 100                            | 55  |
|                        |                         | Cobalt Based                                   | 175                 | 80   | 170                           | 80   | 165                           | 80   | 105              | 50   | 80               | 45   | 90                             | 45   | 80                             | 45  |
|                        |                         | Nickel Based                                   | 190                 | 90   | 185                           | 85   | 175                           | 85   | 110              | 55   | 85               | 50   | 95                             | 50   | 85                             | 50  |
|                        |                         | Titanium Based                                 | 295                 | 140  | 290                           | 135  | 280                           | 130  | 175              | 90   | 130              | 75   | 150                            | 75   | 135                            | 75  |
| H                      | Hard Steel              | >1400 N/mm <sup>2</sup><br>>415 HBN            | 440                 | 205  | -                             | -    | 420                           | 200  | -                | -    | -                | -    | -                              | -    | -                              | -   |
|                        | Chilled Cast Iron       | 1400 N/mm <sup>2</sup><br>400 HBN              | 430                 | 200  | -                             | -    | 385                           | 155  | -                | -    | -                | -    | -                              | -    | -                              | -   |

## Star Guide

## Key to Recommended Inserts

| Material Designations   |  |  |   |   |  |
|---|--|--|---|---|--|
|  |  Unalloyed Steels |  Stainless Steels |  Cast Irons        |  High Temp. Alloys |  |
|   |  Alloyed Steels   |  PH Stainless     |  Aluminum & Alloys |  Hard Materials    |  |











# Ceramic Grade Information

## Recommended Cutting Conditions

| ISO | Materials to be machined | Rm and Max - min                           | Speed SFM                |     |                          |     |                |     |
|-----|--------------------------|--|--------------------------|-----|--------------------------|-----|----------------|-----|
|     |                          |  | SA7402 Ceramic Max - min |     | SA8204 Ceramic Max - min |     | SA8405 Ceramic |     |
| P   | Alloyed Steels           | 700-950 N/mm <sup>2</sup><br>200-280 HBN   | -                        | -   | -                        | -   | -              | -   |
|     |                          | 950-1200 N/mm <sup>2</sup><br>280-355 HBN  | 1310                     | 330 | -                        | -   | -              | -   |
|     |                          | 1200-1400 N/mm <sup>2</sup><br>355-415 HBN | 890                      | 165 | -                        | -   | -              | -   |
| K   | Cast Irons               | Grey GG-Ft                                 | 2300                     | 490 | 2625                     | 490 | 2950           | 490 |
|     |                          | Spheroidal-Ductile GGG-FGS                 | 1980                     | 490 | 2265                     | 490 | 2560           | 490 |
|     |                          | Malleable GTS - MN/MP                      | 1340                     | 490 | 1540                     | 490 | 1740           | 490 |
| S   | High Temperature Alloys  | Iron Based                                 | -                        | -   | -                        | -   | 750            | 375 |
|     |                          | Cobalt Based                               | -                        | -   | -                        | -   | 610            | 300 |
|     |                          | Nickel Based                               | -                        | -   | -                        | -   | 655            | 330 |
|     |                          | Titanium Based                             | -                        | -   | -                        | -   | -              | -   |
| H   | Hard steels              | > 1400 N/mm <sup>2</sup><br>> 415 HBN      | 280                      | 65  | -                        | -   | -              | -   |
|     | Chilled cast irons       | 1400 N/mm <sup>2</sup><br>400 HBN          | 260                      | 65  | 280                      | 65  | -              | -   |

Please refer to the Stellram Ceramic Catalog.

### Star Guide Key to Recommended Inserts

| Material Designations   |                   |   |                   |
|---|-------------------|---|-------------------|
|  P   | Unalloyed Steels  |  M   | Stainless Steels  |
|  K | Cast Irons        |  N | Aluminum & Alloys |
|  S | High Temp. Alloys |  H | Hard Materials    |
|  P   | Alloyed Steels    |  M   | PH Stainless      |