

## Extends Tool Life up to 6 Times Longer than AlTiN Coated Tools

SGS Tool Company is pleased to offer Amorphous Diamond coated, solid carbide end mills to machine nonferrous materials such as graphite, where a cutter's resistance to abrasiveness is paramount. Graphite electrodes can be accurately milled with Amorphous Diamond coated end mills to produce electrodes with exacting detail at an affordable cost. In addition, finishing in graphite, high silicon aluminum, Fiberglass reinforced plastics, and green (pre-sintered) ceramics are other applications well-suited for SGS Amorphous Diamond coated end mills.

### Diamond Thin Film Characteristics

SGS Amorphous Diamond tools are coated with thin film diamond. The thin film diamond conforms to the precise contour of the tool producing a shiny, slippery coating. An outstanding feature of Diamond thin-film is its high resistance to abrasive wear. With its low friction coefficient, the tool runs much cooler and prevents workpiece material from adhering to the cutting edges. This becomes a distinct advantage when no coolant is used in machining graphite.

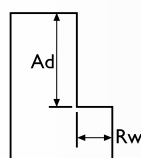
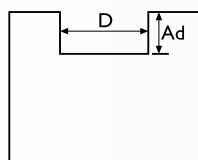
### Characteristics of Diamond Coatings

| Property                | Amorphous            | CVD Diamond             |
|-------------------------|----------------------|-------------------------|
| Diamond Structure       | Amorphous            | Crystalline             |
| Hardness(Gpa) Surface   | 60 - 95              | 85 - 100                |
| Roughness Thickness     | Smooth<br>≤ 1 micron | Rough<br>6 - 20 microns |
| Deposition Temperature  | 150° C               | 850° - 900° C           |
| Special Grade Substrate | No *                 | Yes                     |

\* Any SGS solid carbide tool in stock can be coated with Amorphous Diamond

**Diamond thin-film offers a low coefficient of friction, excellent abrasion resistance, good thermal and chemical stability, and high hardness at drastically reduced costs.**

Graphite milling tests have shown that SGS Amorphous Diamond film can last up to 6 times longer than AlTiN coated carbide tools, but actual tool life will depend on operating conditions.



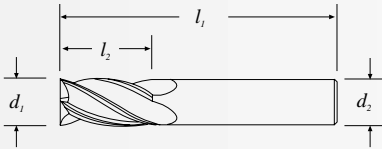
### Speed and Feed Recommendations

| Cutting Diameter<br>Inch mm | Feed Rate per Tooth                       |            |                      |            |                     |            |
|-----------------------------|---|------------|----------------------|------------|---------------------|------------|
|                             | Slotting                                  |            | Peripheral           |            | Contouring          |            |
| Finishing                   | Rw 1 x D                                  | Ad .03 x D | Rw .06 x D           | Ad .45 x D | Rw .02 x D          | Ad .03 x D |
|                             | Speed 3280 - 5900 sfm (1000 - 1800 m/min) |            |                      |            |                     |            |
| Roughing                    | Rw 1 x D                                  | Ad .25 x D | Rw .1 x D            | Ad .65 x D | Rw .1 x D           | Ad .25 x D |
|                             | Speed 1310 - 1970 sfm (400 - 600 m/min)   |            |                      |            |                     |            |
| 1/16 1,6                    | 0.0003 in (0.008mm)                       |            | 0.0004 in (0.010 mm) |            | 0.0005 in (0.011mm) |            |
| 1/8 3                       | 0.0006 in (0.016mm)                       |            | 0.0008 in (0.020 mm) |            | 0.0009 in (0.022mm) |            |
| 3/16 5                      | 0.0013 in (0.032mm)                       |            | 0.0016 in (0.041 mm) |            | 0.0017 in (0.044mm) |            |
| 1/4 6                       | 0.0013 in (0.032mm)                       |            | 0.0016 in (0.041 mm) |            | 0.0017 in (0.044mm) |            |
| 5/16 8                      | 0.0027 in (0.068mm)                       |            | 0.0034 in (0.086 mm) |            | 0.0037 in (0.094mm) |            |
| 3/8 10                      | 0.0027 in (0.068mm)                       |            | 0.0034 in (0.086 mm) |            | 0.0037 in (0.094mm) |            |
| 1/2 12                      | 0.0041 in (0.103mm)                       |            | 0.0046 in (0.117 mm) |            | 0.0050 in (0.127mm) |            |

## Fractional

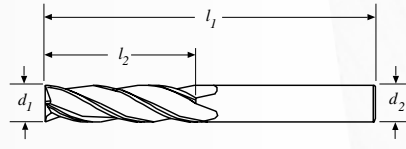
### 4 Flute - Square End

#### Series 1



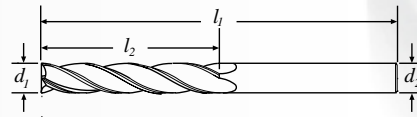
| Cutting Diameter $d_1$ | Length of Cut $l_2$ | Overall Length $l_1$ | Shank Diameter $d_2$ | EDP No. |
|------------------------|---------------------|----------------------|----------------------|---------|
| 1/64                   | 1/32                | 1-1/2                | 1/8                  | 93300   |
| 1/32                   | 5/64                | 1-1/2                | 1/8                  | 93301   |
| 3/64                   | 7/64                | 1-1/2                | 1/8                  | 93302   |
| 1/16                   | 3/16                | 1-1/2                | 1/8                  | 93303   |
| 5/64                   | 3/16                | 1-1/2                | 1/8                  | 93304   |
| 3/32                   | 9/32                | 1-1/2                | 1/8                  | 93305   |
| 7/64                   | 3/8                 | 1-1/2                | 1/8                  | 93306   |
| 1/8                    | 1/2                 | 1-1/2                | 1/8                  | 93307   |
| 3/16                   | 5/8                 | 2                    | 3/16                 | 93308   |
| 1/4                    | 3/4                 | 2-1/2                | 1/4                  | 93309   |
| 5/16                   | 13/16               | 2-1/2                | 5/16                 | 93310   |
| 3/8                    | 1                   | 2-1/2                | 3/8                  | 93311   |
| 7/16                   | 1                   | 2-3/4                | 7/16                 | 93344   |
| 1/2                    | 1                   | 3                    | 1/2                  | 93345   |

#### Series 1L Long



| Cutting Diameter $d_1$ | Length of Cut $l_2$ | Overall Length $l_1$ | Shank Diameter $d_2$ | EDP No. |
|------------------------|---------------------|----------------------|----------------------|---------|
| 1/8                    | 3/4                 | 2-1/4                | 1/8                  | 93324   |
| 3/16                   | 3/4                 | 2-1/2                | 3/16                 | 93325   |
| 1/4                    | 1-1/8               | 3                    | 1/4                  | 93326   |
| 5/16                   | 1-1/8               | 3                    | 5/16                 | 93327   |
| 3/8                    | 1-1/8               | 3                    | 3/8                  | 93328   |

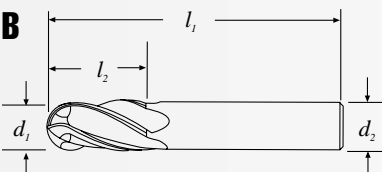
#### Series 1EL Extra Long



| Cutting Diameter $d_1$ | Length of Cut $l_2$ | Overall Length $l_1$ | Shank Diameter $d_2$ | EDP No. |
|------------------------|---------------------|----------------------|----------------------|---------|
| 1/8                    | 1                   | 3                    | 1/8                  | 93334   |
| 3/16                   | 1-1/8               | 3                    | 3/16                 | 93335   |
| 1/4                    | 1-1/2               | 4                    | 1/4                  | 93336   |
| 5/16                   | 1-5/8               | 4                    | 5/16                 | 93337   |
| 3/8                    | 1-3/4               | 4                    | 3/8                  | 93338   |

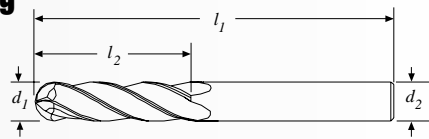
### 4 Flute - Ball End

#### Series 1B



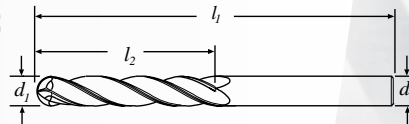
| Cutting Diameter $d_1$ | Length of Cut $l_2$ | Overall Length $l_1$ | Shank Diameter $d_2$ | EDP No. |
|------------------------|---------------------|----------------------|----------------------|---------|
| 1/64                   | 1/32                | 1-1/2                | 1/8                  | 93312   |
| 1/32                   | 5/64                | 1-1/2                | 1/8                  | 93313   |
| 3/64                   | 7/64                | 1-1/2                | 1/8                  | 93314   |
| 1/16                   | 3/16                | 1-1/2                | 1/8                  | 93315   |
| 5/64                   | 3/16                | 1-1/2                | 1/8                  | 93316   |
| 3/32                   | 9/32                | 1-1/2                | 1/8                  | 93317   |
| 7/64                   | 3/8                 | 1-1/2                | 1/8                  | 93318   |
| 1/8                    | 1/2                 | 1-1/2                | 1/8                  | 93319   |
| 3/16                   | 5/8                 | 2                    | 3/16                 | 93320   |
| 1/4                    | 3/4                 | 2-1/2                | 1/4                  | 93321   |
| 5/16                   | 13/16               | 2-1/2                | 5/16                 | 93322   |
| 3/8                    | 1                   | 2-1/2                | 3/8                  | 93323   |
| 7/16                   | 1                   | 2-3/4                | 7/16                 | 93346   |
| 1/2                    | 1                   | 3                    | 1/2                  | 93347   |

#### Series 1LB Long



| Cutting Diameter $d_1$ | Length of Cut $l_2$ | Overall Length $l_1$ | Shank Diameter $d_2$ | EDP No. |
|------------------------|---------------------|----------------------|----------------------|---------|
| 1/8                    | 3/4                 | 2-1/4                | 1/8                  | 93329   |
| 3/16                   | 3/4                 | 2-1/2                | 3/16                 | 93330   |
| 1/4                    | 1-1/8               | 3                    | 1/4                  | 93331   |
| 5/16                   | 1-1/8               | 3                    | 5/16                 | 93332   |
| 3/8                    | 1-1/8               | 3                    | 3/8                  | 93333   |

#### Series 1ELB Extra Long



| Cutting Diameter $d_1$ | Length of Cut $l_2$ | Overall Length $l_1$ | Shank Diameter $d_2$ | EDP No. |
|------------------------|---------------------|----------------------|----------------------|---------|
| 1/8                    | 1                   | 3                    | 1/8                  | 93339   |
| 3/16                   | 1-1/8               | 3                    | 3/16                 | 93340   |
| 1/4                    | 1-1/2               | 4                    | 1/4                  | 93341   |
| 5/16                   | 1-5/8               | 4                    | 5/16                 | 93342   |
| 3/8                    | 1-3/4               | 4                    | 3/8                  | 93343   |