

## Section #4 Polycarbonate

Conditions for Use of Various Tap Drill Sizes

|                     | 2-56                               | 4-40                               | 8-32                               | ¼-20                              | ½-13                              |
|---------------------|------------------------------------|------------------------------------|------------------------------------|-----------------------------------|-----------------------------------|
| Thread Class        | 2                                  | 2                                  | 2                                  | 2                                 | 3                                 |
| Tap Type            | Steel Two Flute                    | Steel Two Flute                    | Steel Two Flute                    | Steel Three Flute                 | Steel Three Flute                 |
| Tap-drill Size      | No. 49<br>(0.073)<br>55%<br>Thread | No. 43<br>(0.089)<br>71%<br>Thread | No. 29<br>(0.136)<br>70%<br>Thread | No. 6<br>(0.204)<br>70%<br>Thread | 7/16<br>(0.4375)<br>63%<br>Thread |
| Tap-drill Speed     | 1200-<br>rpm                       | 1200-<br>rpm                       | 1200-<br>rpm                       | 900-<br>rpm                       | 600-<br>rpm                       |
| Tap Feed            | 20-25<br>ft./min.                  | 35<br>ft./min.                     | 55<br>ft./min.                     | 80<br>ft./min.                    | 60<br>ft./min.                    |
| No. of Holes Tapped | 345                                | 100                                | 100                                | 100                               | 100                               |

*In all cases, tap condition as measured on 30-1 comparitor was good. The tap drills were standard (118° angle, 5° rake) and light-machine oil was used as a lubricant.*

Self-tapping screws of the Parker-Kalon B-F National Screw — Type 25 thread cutting type may be used with Polycarbonate where environmental condition permits. To insure best performance it is important that the diameter of the hole is in proper relation to the diameter of the screw to be used. For example, the correct hole size is 0.147" diameter (approximately the pitch diameter of the screw) for a No. 8 x 1/2 inch screw and the ideal penetration 3/4 inch, about 4 full threads on this screw. The wall thickness from the screw to an edge should at least be equal to the diameter of the screw. Power driven tools can be used but the applied torque should not exceed 30 inch pounds on the No. 8 x 1/2 inch screw and should be proportionately limited for other sizes.

### Sawing

Polycarbonate can be sawed with the types of saws commonly used for wood, metals, and other plastics. Special saw blades are not required nor is speed critical, but for high speed cutting, particularly of thick sections, it is recommended the teeth have

a slight set to reduce friction and provide a smoother surface. Band saw blades with 10 to 18 normal teeth with and without set have satisfactorily cut Polycarbonate at speeds between 1500 and 3000 feet per minute.

### Turning

Conventional metal working lathes may be used for turning, boring and threading Polycarbonate. Tools may have 0° rake and 3° clearance while boring and threading and roughing-out tools should have a 5° rake. For carbide-tipped tools, a negative rake of 0° to -5° has been found best. Sharp tools are strongly recommended to obtain smooth surfaces.

Speeds to use depend upon the quality of the surface required. High speeds with a small feed rate and thin bite will provide the smoothest surface. Good results are obtained at turning speeds between 500 to 1000 feet per minute and a feed rate of .005" and .025" per revolution per 0.2" cut depth. In no turning, boring or threading operation should the use of a coolant be necessary. Should sticking or softening occur reduce the feed rate or bite. If production schedules dictate higher rates, only water should be used as a coolant as most cutting oils and oil emulsions cause crazing of polycarbonates. When the feed bite and speeds are properly adjusted the cutting will curl away in a long opaque spiral much like aluminum.

Polycarbonate may be turned to a rod diameter of 1/4". Below this diameter it has a tendency to whip when supported only on one end. Air cooling may aid in retaining rigidity if the speed is high. A rod of this diameter can be easily threaded by machine with a steel-working die, again without the use of lubricants.

### Milling and Routing

The use of high-rotating speeds or low-feed rates are advisable for end-milling Polycarbonate. For example, a 100-mil cut with a 3/4" full-lip end mill turning at 425-rpm caused edge chipping at the feed rate of 30 inches per minute; but it produced a smooth cut at a 22-inch-per-minute feed. The higher feed rate is permissible if a 2100-rpm milling speed is used. The lower speed (425-rpm) is recommended for side cut or climb milling at a feed rate of 30 inches-per-minute. Within these prescribed limits, no coolant-lubricant is necessary.