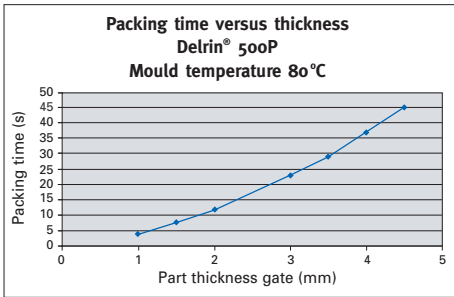


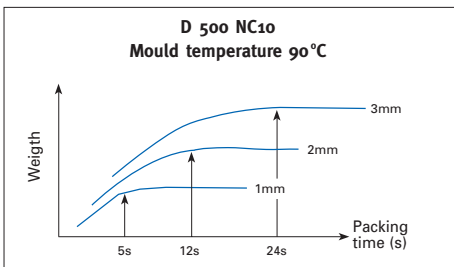
PACKING OF DUPONT™ DELRIN®

Delrin® is one of the most crystalline of the semi-crystalline thermoplastics (at over 80% crystallinity). As a consequence, the difference between its melt density (1.16 g/cc) and its solid density (1.42 g/cc) is relatively high (16%), in other words the crystallization (solidification) of the polymer leads to a large volume drop. This drop should be compensated by the injection of additional molten resin into the mold cavity, during the entire packing time, to produce a solid part and without voids and uncontrolled shrinkage. You should also note that at the end of a correctly set and efficient packing phase, Delrin® does not need further cooling time as the whole part is crystallized and solid.

The packing time is a function of part thickness:



However, care should be taken to ensure that the maximum part weight corresponds to the optimum packing time for the part thickness at the gate.



To achieve this, there are some fundamental differences in gate and runner design versus those used for amorphous materials (major risk of a bad process with amorphous materials is over-packing, whilst with semi-crystalline materials it is the problem of shrinkage).

Note that in the diagram below, the gate design on the right would give problems for Delrin® (or any highly crystalline polymers), because such conical gate sections crystallize before the end of complete part pack out.

This results in low mechanical performance (by up to 30%), warpage and uncontrolled shrinkage.



The gate on the left of the diagram is considered suitable for Delrin® as it meets following design criteria:

- always gate in thickest area of the part;
- diameter of the gate "d" must be at least half the part thickness. The length must be shorter than 0.8 mm (0.03 in) to prevent premature gate freezing during packing;
- **the inscribed diameter "D" of the tunnel next to the gate must be at least the part thickness "T" + 1mm.**

SUMMARY: The high crystallinity of Delrin® requires the compensation of volume drop during solidification. To prevent the generation of voids and control shrinkage, the gate and runner should be large enough to allow the addition feed of resin during the packing time. Despite the part being hot, it is also solid, and therefore requires no further cooling time. An adequate packing time will secure both part performance and dimensional consistency from shot to shot.