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# Precise Molding Process by Inducing Sink Mark

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Plastic optical parts, like the f-theta lens, should be molded, as their inner strain is low. To keep inner strain down, molten resin should be injected into the cavity at a lower than normal pressure. Such injection conditions, however, result in inferior figure accuracy because of resin shrinkage.

We have developed a unique molding process in which injection is done at lower pressure to get molded items with low inner strain and high figure precision as well. With our new process, molten resin is injected into a cavity at a lower than normal pressure. Then, early in cooling time, the resin is broken away from a part of the cavity surface and a free surface of the resin appears in the cavity.

This free surface should be designed at a point where the figure specification is loose. Because the free surface faces an air gap, which works as a heat insulating layer, the resin around it cools slower than resin of other parts, where contact is maintained with cavity surfaces of mold parts. As a result, shrinkage of the resin concentrates on the free surface during the later cooling time and sink marks appear there.

On the other hand, the resin at other parts can precisely replicate shapes of the cavity surfaces with which contact is kept. This occurs because most warpage caused by shrinkage is induced around the free surface. The precision of f-theta lenses molded by this process is less than 5microns of the PV value compared with the designed lens figure. Its inner strain is also sufficiently low for optical uses, thanks to the low injection pressure and strain-relief effect of this process.