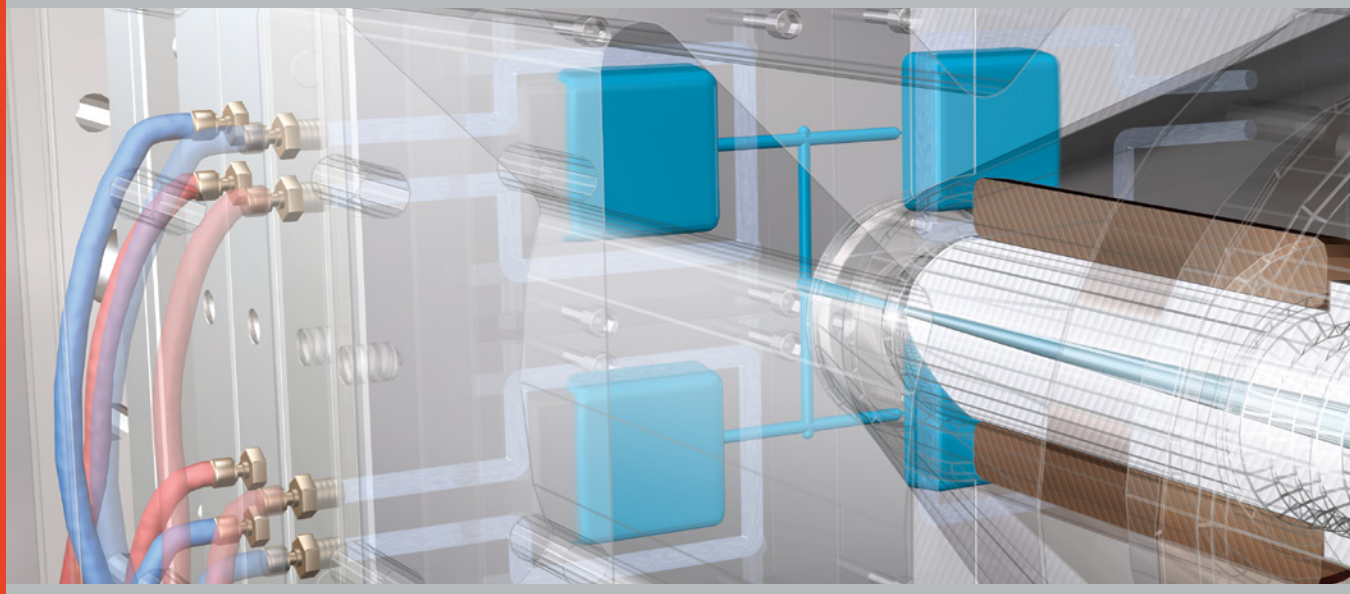
REFERENCE SERIES: DESIGN

Gate Design: Manual Degating



nexeo plastics

Created exclusively for **Nexeo Plastics** by Routsis Training, this free guide contains excerpts from Routsis's ***Mold & Part Design Courses***.

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MANUALLY-DEGATED GATES

Sprue Gate

The Sprue Gate is the simplest gate and fills directly from the nozzle. Therefore, these gates can only be used with single cavity molds. Since it is the widest gate available, the sprue gate is used to fill large parts.

When molding parts having contoured surfaces, the sprue bushing must contain the same contour as the cavity surface. To prevent the sprue from turning during production, dowel pins are used to secure the sprue bushing.

Due to their size, sprue gates leave a large amount of vestige and are difficult to separate from the part. Separating the gate from the part often requires large gate cutters. To remove the vestige, parts often require a secondary operation, such as machining or filing.

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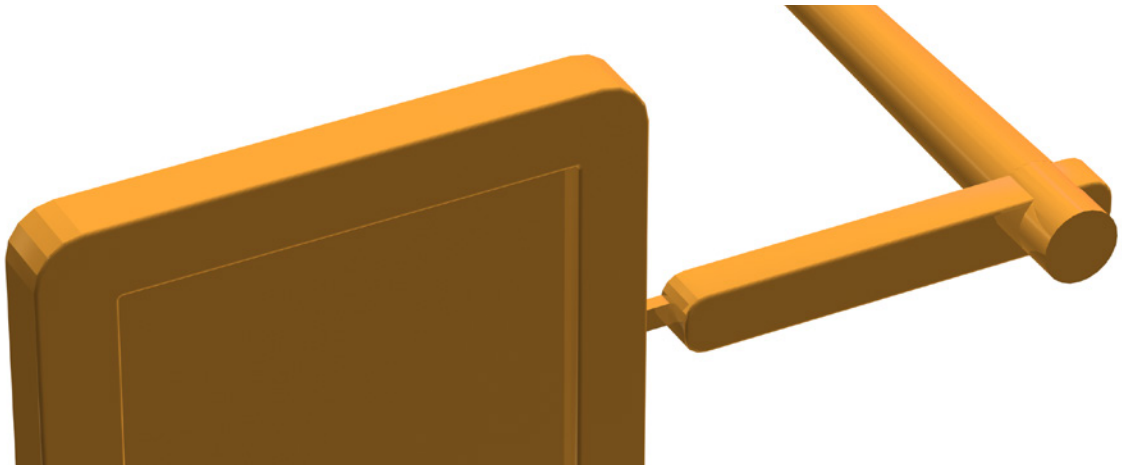
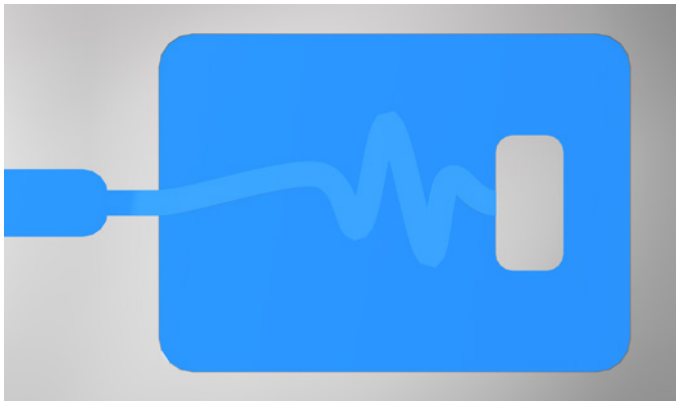
Edge Gate

Edge Gates are the most common gate, and are typically used on molds having thin or small cavities. These gates are easy to machine and are normally milled using an endmill. An edge gate should be approximately 1/3 of the part thickness at the mold cavity. To optimize, by easing removal and promoting a better flow, a tapered edge gate can be produced using a die sinker EDM machine.



Edge Gates and other smaller gates create high-shear rates by restricting the polymer flow. When these gates are located at large open areas, Jetting may occur.



Jetting is a defect caused by material entering the cavity in a stream or spray.
To create a smooth laminar flow front, edge gates should flow directly into a wall or part feature.

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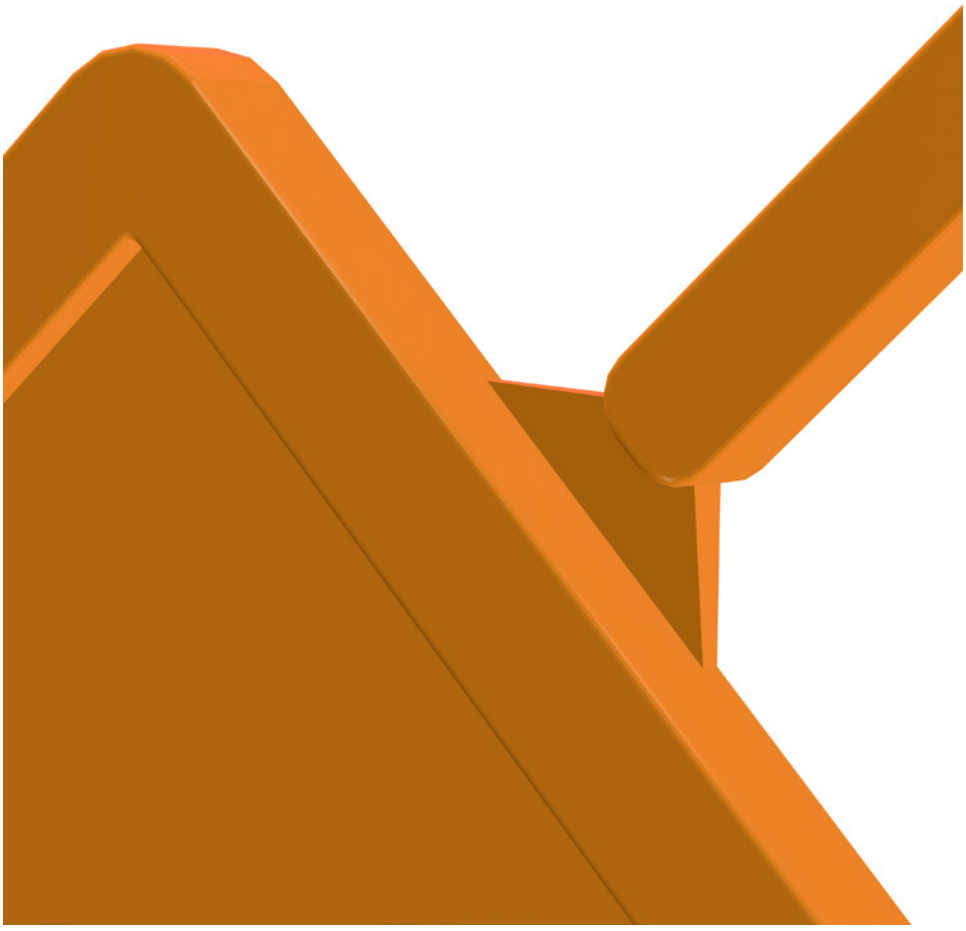
Fan Gates

Fan Gates are used to fill large, high tolerance parts. These gates use a large amount of material, yet promote a smooth polymer flow across the part and decrease warpage. This gate widens as it approaches the mold cavity, and tapers down to approximately one-quarter of the part thickness.

The fan gate is difficult to mill because of its geometry, and typically requires the use of an electrode in a die sinker EDM machine.

Since the fan gate contacts the part over a large area, it is difficult to remove and a large amount of vestige is left behind. As with the sprue gate, a secondary operation is typically required.



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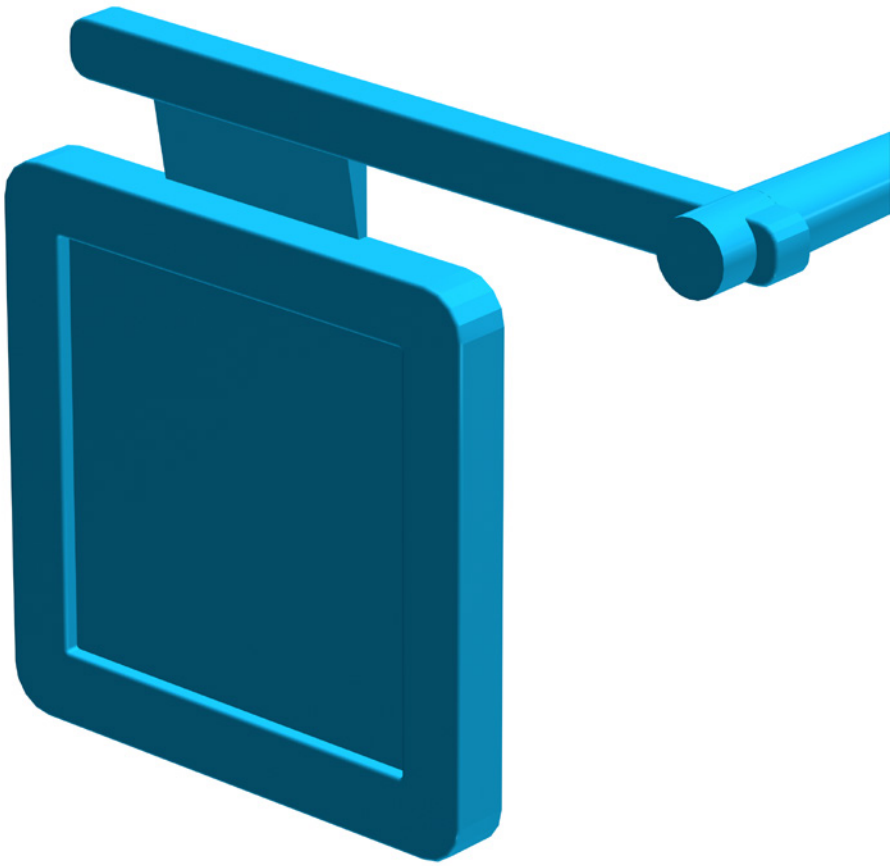
Flash Gate

Flash Gates are similar in design to edge gates, but pass the material from the side of the runner to the mold cavity using a larger contact area. These gates can be machined using either a milling machine or a die sinker EDM machine.

The flash gate tapers to approximately one-quarter of the part thickness at the mold cavity. Like fan gates, flash gates promote a smooth flow along the part, are difficult to separate, and leave behind a large amount of vestige.

Flash gates are recommended for multiple-cavity molds that demand a large gate to fill the part, or in family molds, where multiple parts are filled from a main runner.



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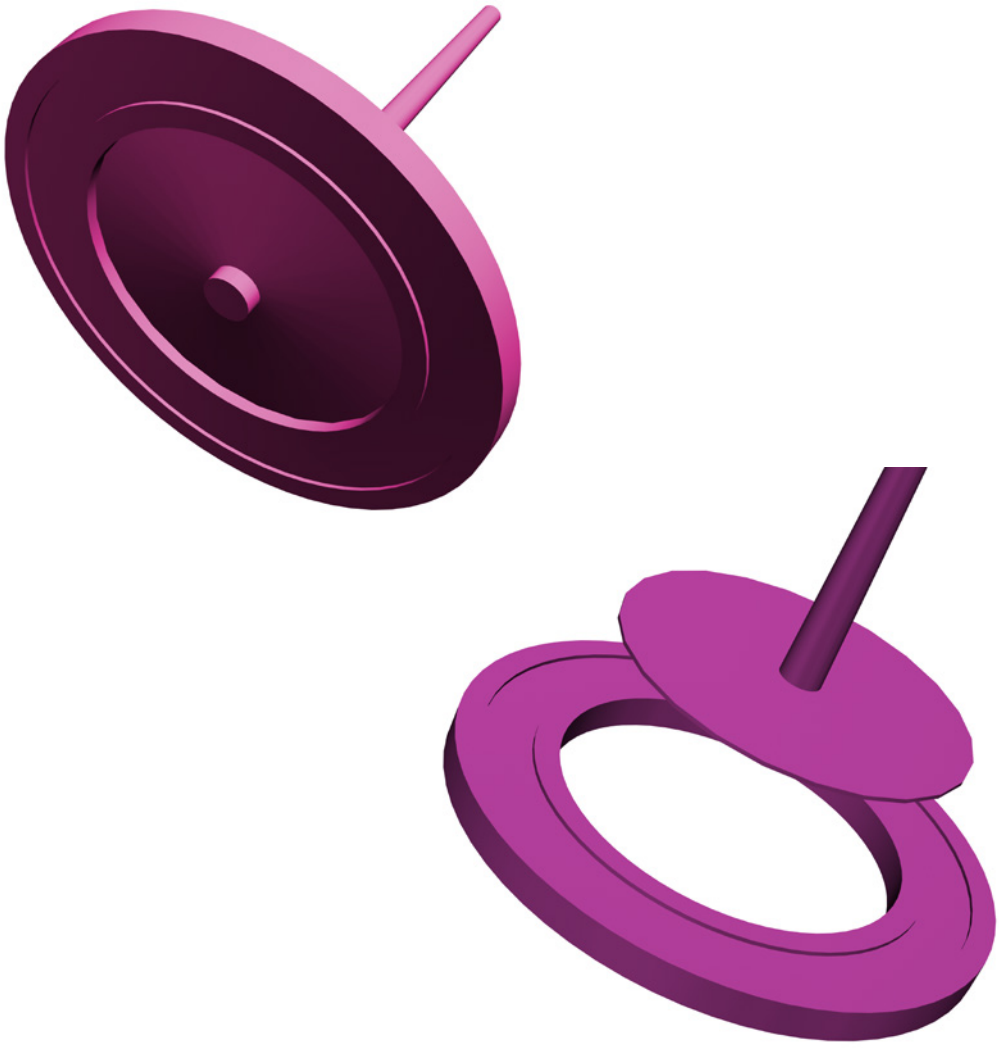
Disc Gate

Disc Gates are round, tapered gates that fill from the center of the part. These gates promote a large and even polymer flow and are ideal for round and concentric parts, such as compact discs and cylindrical housings. Since disc gates originate from the sprue, they can only be used to fill single-cavity molds.

Disc gates taper down to less than 25% of the part thickness at the mold cavity. These complex gates can either be machined into the mold using a CNC milling machine, or a die sinker EDM machine.



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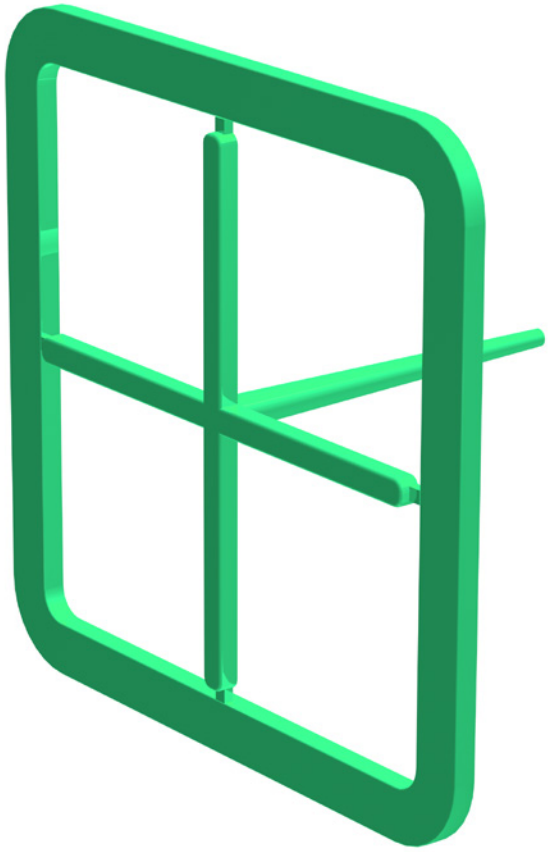
Spoke Gate

A Spoke Gate consists of a series of edge gates projecting outward from a central sprue, and is used to fill single-cavity molds. These gates allow a large amount of material to reach the cavity quickly, since several gates are used.

Unfortunately, spoke gates inherently create weld lines and promote jetting.

Spoke gates are simple in design and can be machined by milling or die sinking EDM. The cross section of each gate can be modified to control the flow across the part.

Spoke gates are ideal for large parts containing a hole in the middle of the part. Since multiple gates are used for a single part, removal often requires gate cutters and a large amount of vestige is left behind.



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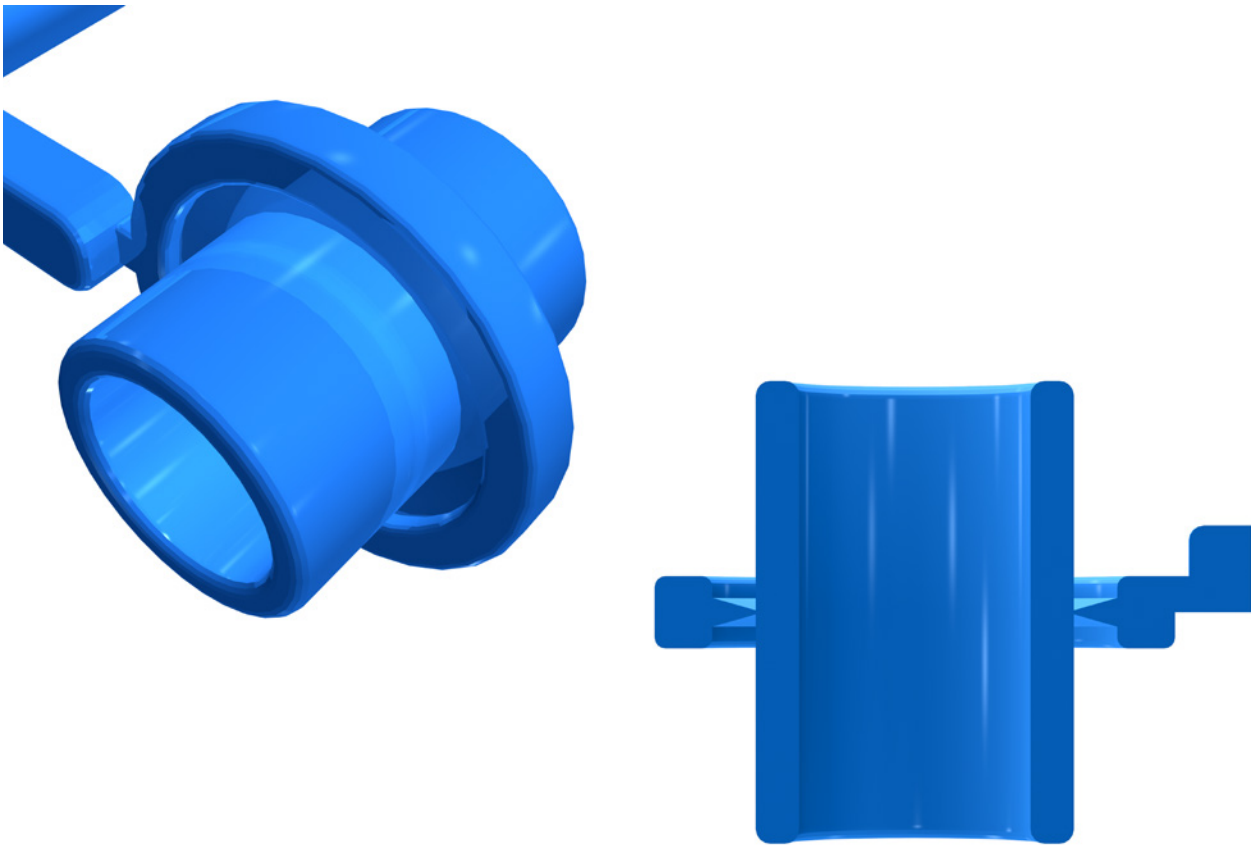
Ring Gate

Ring Gates are large gates designed to fill the mold cavity from the perimeter. During injection, the ring is filled, and then a smooth laminar flow is released into the part.

These complex gates are difficult and time-consuming to machine, and usually require a CNC milling machine or a die sinker EDM machine. This gate design uses a ring of approximately the same thickness as the part, and tapers down to less than 1/4 of the part thickness.

Ring gates are only used for round parts having high tolerances. These gates typically end up using just as much material for the gate as they do for the part.

Ring gates are difficult to separate from the part since the entire perimeter of the part comes in contact with the gate, leaving gate vestige all around the part.



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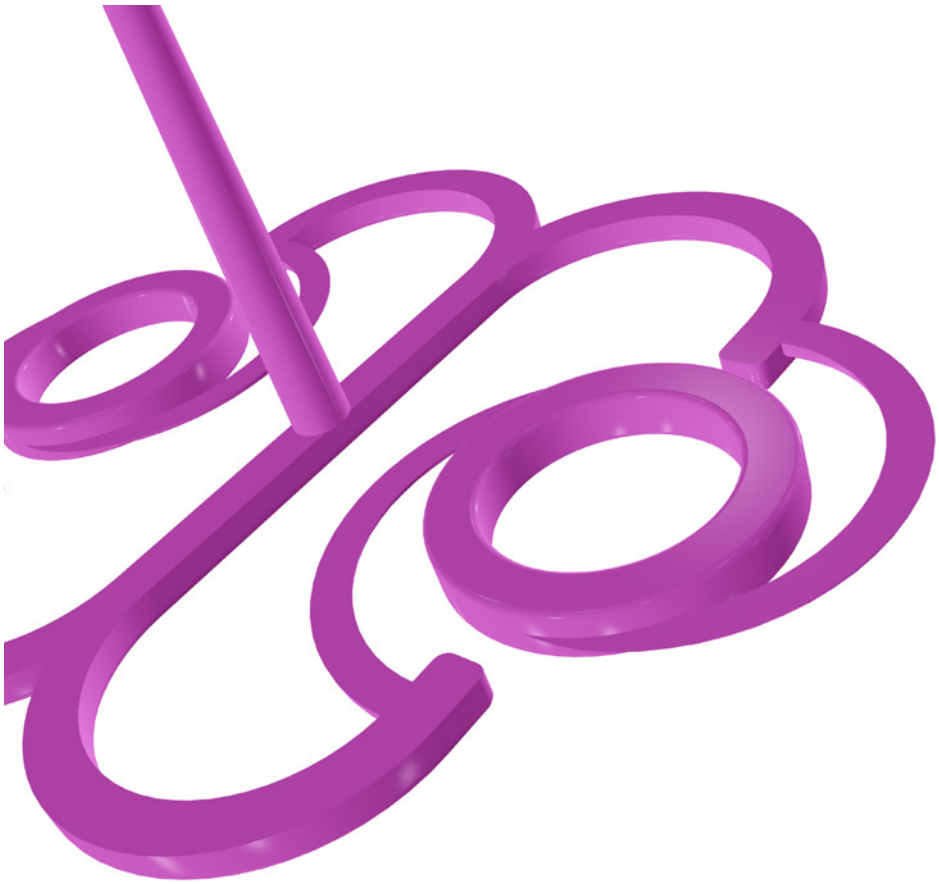
Tangential Gate

Tangential Gates flow around the part and spiral inward towards the edge of the mold cavity. These gates can be machined using a ball endmill in a helical cutting path, or in a die sinking EDM machine. The spiral gate begins at the runner, and tapers down to 1/3 of the part thickness.

Tangential gates are only used to fill round parts and to promote a circular flow. Multiple gates can be used to increase weld line strength. Although the number of weld lines increases as more gates are used, the strength and durability of the part is significantly improved.

Compared to ring gates, tangential gates are easier to remove from the part and generate less runner scrap. Tangential gates are typically used for round or cylindrical parts that demand improved weld line strength.



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