THERMOLAST K in Injection Moulding: Moulds

1. The Runner System in the Mould

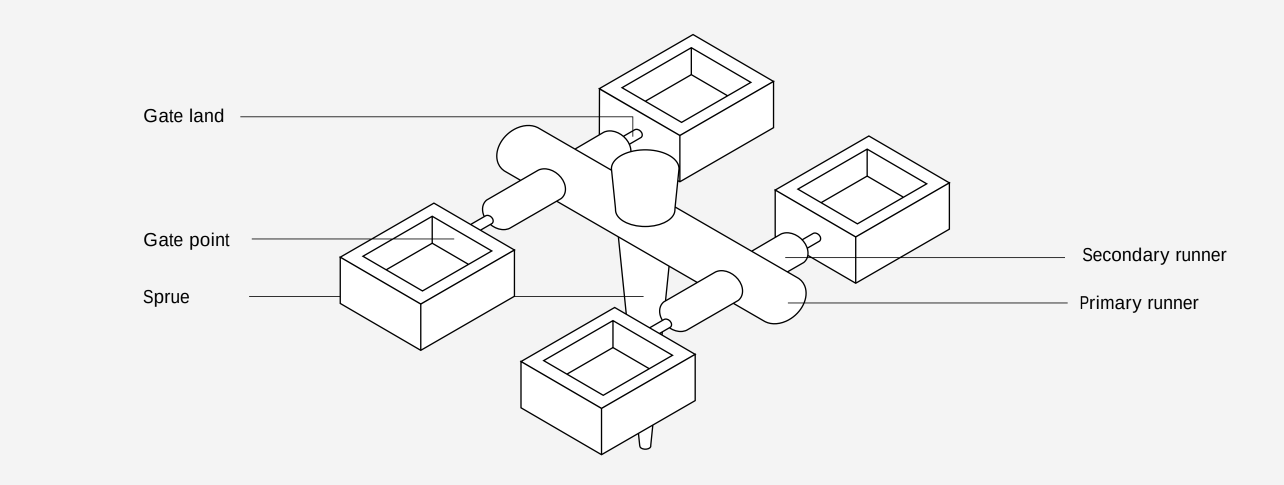

Figure 2:
Overview of runner system with individual components as designated in the following text.

2. Balancing the Runner System

- A balanced runner system in the mould is important in order to ensure that all cavities are filled evenly (see Figure 3).
- In an unbalanced system cavities closer to the sprue are overfilled and those further away are not filled completely (see Figure 4).

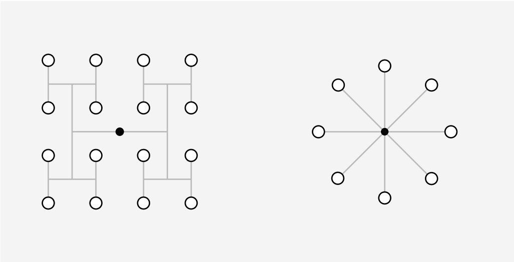

Figure 3: Balanced runner system
The flow path from the sprue to the cavity is always the same distance. The primary and secondary runners are also properly dimensioned relative to one another.

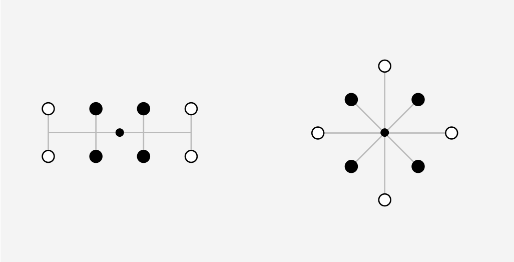

Figure 4: Non-balanced runner system
Flow paths from the sprue to the individual cavities differ in length. Cavities nearer to the sprue are overfilled and those further away are not filled completely.

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3. Gate Points

The excellent rheological characteristics of THERMOLAST K often eliminate the need for multiple gate points in large cavities or cavities with long flow paths. The following point should be noted with regard to THERMOLAST K rheology: As friction increases, viscosity decreases. The gate should therefore be located such that the melt contacts a wall or core shortly after entering the cavity. Unrestricted flow, i.e. jetting, is to be avoided under all circumstances. Systems designed in accordance with these points will permit longer flow paths, and provide improved part surfaces. Ideally the diameter of the gate should be between 0.4 mm (0.016 in.) and 0.6 mm (0.024 in.), with a maximum of 1.0 mm (0.039 in.). A small depression (with a lens-like curve) will ensure that the gate on the part is very clean.

4. Sprue

For processing THERMOLAST K we recommend standard sprues with a draft angle of at least 1.5°. When compounds with hardness ratings less than 70 Shore A are processed, the draft angle should be at least 2.5°. "Z" type sprue pullers can be used except when processing soft THERMOLAST K compounds. Conical pullers (undercuts) can be used with most compounds.

5. Primary and Secondary Runner System

Normally semi-circular or trapezoidal runner channels can be used; however, round runner channels are best as they have a smaller surface area for a given cross-section. The secondary runner channels to the moulds should be large enough to allow the hold pressure to be maintained for a sufficient length of time. The diameter of the secondary runners should be slightly smaller than that of the primary runner.

All types of hot runner systems are suitable for use with THERMOLAST K. Internally heated systems offer some slight advantages. Diameters should be chosen such that the volume of the hot runner is smaller than the finished part. If this is not the case, the hot runner should be empty after a maximum of 2 – 3 shots.

THERMOLAST K in Injection Moulding: Processing

6. Types of Gates

Mechanical properties such as tensile strength and elongation at break of THERMOLAST K injection moulded parts are dependent on the direction of flow in injection. The resultant molecular orientation normally results in increased tensile strength and elongation at break perpendicular to the flow path.

The gate should therefore be selected in accordance with the part design: In general, submarine or pin gates can be used with THERMOLAST K. As noted above, the gate must be located such that the material contacts a wall or a core shortly after entering the cavity. Film gates are used in order to achieve a parallel orientation across the entire width, to achieve uniform shrinkage in the direction of flow and the transverse direction and to prevent visual defects such as gate marks on the surface.

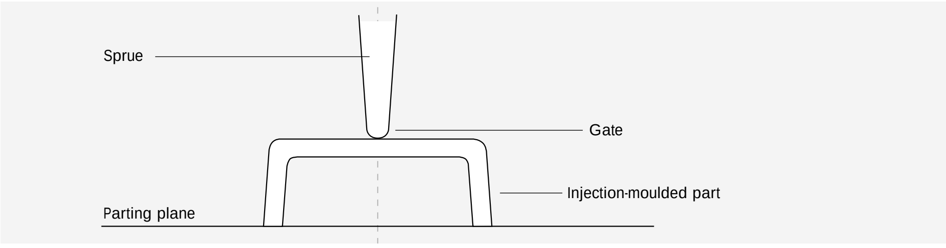

Figure 5: Pin gate

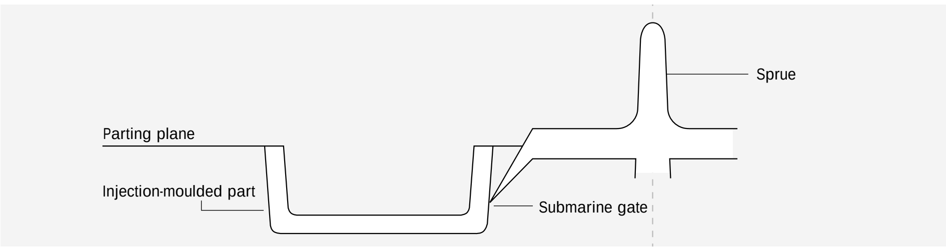

Figure 6: Submarine gate

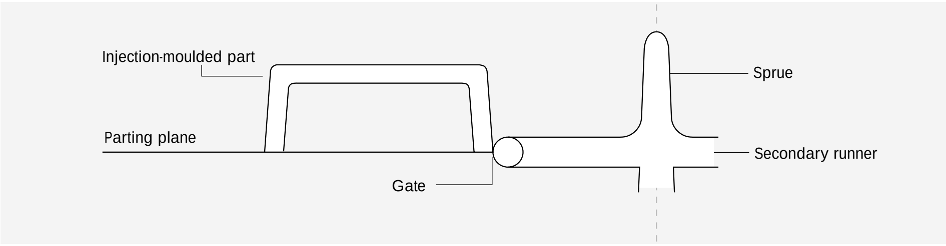

Figure 7: Film gate

THERMOLAST K in Injection Moulding: Processing

7. Venting

Insufficient venting usually results in
- incomplete filling of cavities
- surface defects
- burn marks

Apart from avoiding the above problems, optimum venting can also reduce cycle times in some cases. Venting can take place at the mould parting line. Usually we recommend that venting is done at a position furthest away from the gate point or at the position of the joint line. A filling study can be carried out to determine the correct venting position.
Usually vent channel depths of between 0.01 mm (0.0004 in.) and 0.02 mm (0.001 in.) are sufficient to ensure good venting.

8. Mould Surfaces and Demoulding

Parts made of THERMOLAST K usually exhibit high surface friction. Soft compounds also tend to stick by suction to smooth mould surfaces. Spark-eroded moulds decrease adhesion to the moulded part and hence facilitate demoulding.

Ejectors should be selected in accordance with the hardness of the compound processed. When processing soft grades, large-area ejectors are preferable to ejector pins.

Due to the elasticity of THERMOLAST K, undercut parts can frequently be ejected from simple undercut moulds without need for a pusher, i.e. by simply pressing the parts out of the mould. Air-pressure supported ejectors are beneficial with soft compounds and more pronounced undercuts.

9. Mould Temperature

Optimum physical properties of finished parts are normally achieved with mould temperatures between 25° C (75° F) and 40° C (105° F). When producing parts with very low wall thickness, higher temperatures should normally be used.

For more information, e.g. with regard to co-injection moulding, please refer to the processing overview in the appendix. In addition, our application engineers will be happy to provide you additional information relevant to your specific application.