



Quick Guide to Injection Molding

Kalix® 9950

Equipment

Kalix® 9950 resins can be processed on conventional injection molding equipment.

- Estimated clamp tonnage of 1 T/cm² (4 T/in²) is required.
- Standard (general purpose) screws with a compression ratio between 2:1 and 3:1 and a L/D ratio between 15:1 and 20:1 are suggested.
- Use a ring-check valve, not a ball-check valve.
- Use a reverse taper nozzle to minimize drooling or freeze off.
- Use insulation plates between the mold and machine platens.
- Use a mold temperature control unit with either water or oil depending on the processing temperatures required.
- When using oil heaters, ensure that lines, seals, and heat transfer fluids are suitable for the processing temperatures.
- Use a desiccated hopper dryer to ensure that the resin remains dry during processing.
- Select a barrel capacity for a residence time no greater than 6 minutes. An indication of the residence time is given by:

$$\text{Residence Time, Minutes} = 2 \times \frac{\text{Barrel Capacity} \times \text{Cycle Time, Seconds}}{\text{Shot Size} \times 60}$$

- Hot runner systems must be designed for high-temperature crystalline polymers.

Table 1: Drying instructions

| Drying Method | Temperature | Hours |
|---------------|----------------|--------|
| Desiccant | 80 °C (176 °F) | 4 – 12 |

Drying

Kalix® 9950 compounds are delivered in granular form (bulk density around 0.7 g/cm³) usually in 25 kg bags or 1 ton octabins. Although both package types are sealed and water-tight, it is recommended to dry the material according to the guidelines in Table 1 before molding.

Injection

The settings of the injection phase cannot be carried out until the mold temperature and material temperature are correct and verified. See Table 2 for starting point molding conditions.



Table 2: Starting point molding conditions

| | |
|--|--|
| Material temperature, purged (standard grades) | 285 °C – 305 °C (545 °F – 581 °F) |
| Cylinder temperatures | |
| Feed zone | 250 °C – 280 °C (482 °F – 536 °F) |
| Compression zone | 250 °C – 280 °C (482 °F – 536 °F) |
| Metering zone | 250 °C – 280 °C (482 °F – 536 °F) |
| Nozzle zone | 260 °C – 290 °C (500 °F – 554 °F) |
| Hot runners (when used) | 250 °C – 280 °C (482 °F – 536 °F) |
| Mold temperature | 80 °C – 140 °C (176 °F – 284 °F) |
| Injection speed | High, 0.5 s – 2.5 s |
| Hold pressure | 500 bar – 1,500 bar (specific) (7,250 psi – 21,750 psi) |
| Back pressure | 0 bar to 10 bar (hydraulic) (0 psi – 150 psi) |
| Screw speed | 3 m/min – 10 m/min |

Temperature

- Kalix® 9950 compounds require a mold temperature of 80 °C – 140 °C (176 °F – 284 °F).
- Verify the temperature of the mold cavities using a temperature probe.
- Confirm the melt temperature using a temperature probe moved about in a volume of melt, shot onto an insulator (a glove, cardboard, etc.).

Shot Volume

- Set the initial cooling time.
- Set a zero hold time and/or pressure.
- Inject incomplete parts by gradually increasing the shot volume using an average to high injection speed.
- When the mold is almost filled (95 % to 98 %), set the initial hold pressure and gradually increase the hold time. See Table 3 for more specific guidelines.
- In this way, the end of the filling is done under constant pressure and part over-packing is avoided.

Table 3: Hold and cooling

| | |
|-----------------------|--------------------------------|
| Hold time, seconds | $3 \text{ s} \times w^{(1)}$ |
| Cooling time, seconds | $2.5 \text{ s} \times w^{(2)}$ |

⁽¹⁾ w = wall thickness, mm

⁽²⁾ w = wall thickness, mm, ≥ 2 mm

Troubleshooting

Table 4 is a troubleshooting guide that contains the solution to many common molding problems. If problems persist, contact your Solvay representative for additional assistance and technical service.

Safety Procedures

Proper safety procedures must be followed at all times.

All machine guards and covers must be in place. Required personal protection equipment must be worn. Face shields, gloves, and long sleeves are recommended. Purge barriers should be placed against the sprue bushing to protect the tool. Purged materials are very hot and should be handled and disposed of with care.

Always be alert of the possibility that resin decomposition can occur. Typical signs of resin decomposition include badly discolored resin purge and excessive gas generation. When resin decomposition is suspected, assume that gas at high pressure is present and take appropriate action to prepare for the release of high-pressure gas. Be particularly cautious with plugged nozzles and follow all established safety guidelines.



Table 4: Troubleshooting guide

| Problems | Suggested Remedies |
|---|--|
| Greasy spots on the parts and mold (signs of degradation) | <ul style="list-style-type: none"> • Reduce material temperature (screw and/or hot runners) |
| Whitish spots (same phenomenon but with cold mold) | <ul style="list-style-type: none"> • Increase mold temperature • Reduce material temperature (screw and/or hot runners) • Release agents, lubricants |
| Bad surface appearance | <ul style="list-style-type: none"> • Increase mold temperature • Increase injection speed • Verify holding time and pressure |
| Glass fibers visible on surface | <ul style="list-style-type: none"> • Increase mold temperature • Increase injection speed • Increase runner dimensions • Increase material temperature |
| Jetting | <ul style="list-style-type: none"> • Modify gate location • Reduce the initial injection speed • Increase cross-sectional area of gate |
| Burning | <ul style="list-style-type: none"> • Increase venting • Reduce injection speed at end of filling |
| Incomplete part | <ul style="list-style-type: none"> • Increase shot volume • Increase injection pressure and speed • Increase runner dimensions • Increase material temperature • Increase venting |
| Deformed part | <ul style="list-style-type: none"> • Increase the temperature of the mold • Modify the part design, avoiding major thickness differences • Increase holding pressure to reduce shrinkage • Modify position and/or dimension of the gate • Increase the cooling time |
| Part or sprue sticks in mold | <ul style="list-style-type: none"> • Reduce holding time • Reduce holding pressure level • Increase the draft angle of the mold cavity |
| Sink marks | <ul style="list-style-type: none"> • Increase the holding time and pressure • Change the position and dimension of the gate |

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