

ALTUGLAS®  
ALTUGLAS® LUCTOR

ACRYLIC RESINS

# Injection Molding Guide



ALTUGLAS®  
BY ARKEMA

## Injection Molding Guide

### Introduction

Altuglas® Medical Resins offer a history of over 30 years of outstanding performance and durability and our new Altuglas® Luctor resin adds to this legacy. Designed specifically for disposable medical devices, Altuglas® Luctor provides excellent chemical resistance to ethyl and isopropyl alcohols. Just like our Altuglas® Medical Resins, Altuglas® Luctor has excellent scratch resistance, outstanding bonding characteristics and good optical properties. Additionally, these resins offer ease of processing and exceptional flow properties, allowing for their use in a wide range of molding processes.

### Drying Conditions

Altuglas® Luctor and Altuglas® Medical Resins are somewhat hygroscopic which can affect the appearance or performance of the device if molded with excessive moisture content. Altuglas® Medical Resins will exhibit aesthetic defects such as streaks, splay, or splash marks. Altuglas® Luctor will exhibit the same aesthetic defects as well as a reduction in physical properties. Because moisture (water) is a volatile substance and will more readily vaporize at higher processing temperatures, the resins need to be dried prior to use. The degree of recommended % moisture content will depend on the user's processing temperature. For example, to mold at temperature around 260°C, the material will have to be drier in order to avoid aesthetic defects than if molded at 232°C. Moisture levels of 0.05% are satisfactory for low barrel temperatures. For high barrel temperatures, moisture levels down to 0.02% or less will be needed.

To achieve the best possible drying, a dehumidified or desiccant drying system is recommended. Dew points of -29°C to -40°C are recommended in these systems. Dew points above -18°C are unsatisfactory. Recommended drying temperatures differ for Altuglas® Luctor and Altuglas® Medical Resins. Altuglas® Medical Resins should be dried for 4 hours at 82°C within the dew point range listed above and Altuglas® Luctor should be dried under the same conditions but at a lower temperature, 65°C. Proper drying temperatures and drying time will ensure zero moisture related defects.

### Injection Molding Equipment

Reciprocating screw injection molding machines equipped with a general-purpose screw design are adequate for processing Altuglas® Luctor and Altuglas® Medical Resins. This screw design, typically used for thermoplastic materials, should have 50% of its length as the feed zone, 25% as the compression zone, and 25% as the metering zone. A screw L/D (length to diameter) ratio between 18:1 and 24:1 and a screw compression ratio between 2:1 and 3:1 are recommended. A floating check ring, rather than a ball check, is also recommended. Nozzles should be of the free-flow design and as short as possible.

### Mold Requirements

Molds should have adequate coring to permit good water circulation from mold circulators. Water temperatures can be adjusted from 38°C to 66°C to achieve the best balance of part appearance and cycle time. The surface of the mold cavity should be a stainless steel or high chrome tool steel with a minimum Rockwell C scale hardness value of 35. The mold surfaces should be highly polished to SPI-SPE mold finish #1 or #2 to achieve molded parts with maximum gloss. Most gating techniques are suitable including sprue, edge, tab, and tunnel.

Since Altuglas® Luctor and Altuglas® Medical Resins are amorphous materials, mold shrinkage will vary depending on the molding conditions used. Mold shrinkage variation can range from .003 to .008 mm/mm. Adequate venting is required to eliminate trapped gases in the mold and to prevent diesel burning. Whether sunburst vents or a continuous venting system is employed during production, we recommend vent depths of 0.05 mm are used.

### Injection Molding Parameters

Altuglas® Luctor and Altuglas® Medical Resins have a large processing window. The following table lists recommended start up conditions although adjustments may be necessary to achieve an optimum process depending on the specific part and mold design and machine capabilities. To ensure less molded-in stress in the final parts, the resins should be processed at the upper end of their processing window.



## Typical Start-Up Injection Molding Conditions

For Single Stage, Non-Vented Barrel Machines

Grade	Cylinder Temperature				Other Parameters			
	Rear Zone (°C)	Center Zone (°C)	Front Zone (°C)	Nozzle (°C)	Injection Speed	Screw Speed (RPM)	Back Pressure (Bars)	Mold Temp (°C)
Luctor	220	220	225	220	Medium	50-100	7-10	40
SG10	220	225	230	225	Medium	50-100	7-10	70
SG7	215	220	225	220	Medium	50-100	7-10	65
VS UVT	180	190	195	190	Medium	50-100	7-10	55

### Purge Procedures

1. Thoroughly clean the feed hopper after removing all of the resin.
2. Retract the injection unit carriage from the mold, leaving ample room for the purge to exit the nozzle.
3. Purge the resin from the barrel and thoroughly clean the nozzle, nozzle tip and sprue bushing.
4. Set injection barrel temperature profile to at least 260°C but do not change the profile if it is >260°C. This temperature will ensure that the resident resin melts.
5. Load 5-10 times the barrel capacity of Altuglas® V046 into the feed hopper. Material need not be dry.
6. Set the back pressure to 0 and the shot size to >50% of the maximum allowable setting. Alternate the injection speed between high and low and purge until polymer exiting the nozzle is free of contaminant.  
Note: For additional cleaning, move the screw completely forward and use the maximum

safe screw speed and back pressure while purging. Alternatively, employ a purge compound such as Pekutherm® N at a 50/50 ratio with Altuglas® V046. This compound is a high molecular weight PMMA resin. Load 5-10 times the barrel capacity of this mixture into the feed hopper. Repeat step six until polymer exiting the nozzle is free of contaminant. Then load the feed hopper with 2-3 times the barrel capacity with 100% Altuglas® V046. Material need not be dry.

7. Set the barrel zone temperatures to the recommended temperature profile for Altuglas® or Altuglas® Luctor. With the back pressure set at 0 and the shot size > 50% of the maximum allowable setting, purge the Altuglas® V046 once every 15 minutes until the barrel temperature profile stabilizes.
8. Remove Altuglas® V046 from the feed hopper and replace with Altuglas® or Altuglas® Luctor medical resin and begin normal molding.

### SHUTDOWN for Long Delays (>5 minutes)

For long delays, the carriage should be retracted, the feed slide closed, the screw and barrel emptied of material and the barrel heaters should be lowered to 149°C. For overnight shutdowns, the barrel should be emptied and the heaters turned off. A voltage reduction switch for the heaters is suggested as a safety procedure.



**About Altuglas International, a subsidiary of ARKEMA:**

Altuglas International, world leader integrated in PMMA, is heavily involved in the field of engineered plastic - from MMA monomer to PMMA Acrylic glass - Altuglas International designs and manufactures highly innovative products tailored to the specific needs of its global customers. Its 1300 committed employees contribute daily to the success of its three areas of business (MMA, acrylic sheets and PMMA resins). Find out more at [www.altuglasint.com](http://www.altuglasint.com).

Arkema strictly prohibits the use of any product, including medical grades, in applications that are implanted in the body or in contact with bodily fluids or tissues for greater than 30 days.

Arkema products, including medical grades must not be used in applications that are implanted in the body or in contact with bodily fluids or tissues for greater than 30 day and disclaims any and all warranty in relation to the same. Unless Arkema otherwise expressly agrees by written contract, the Arkema trademarks and the Arkema name shall not be used in conjunction with customers' medical devices, including without limitation, permanent or temporary implantable devices, and customers shall not represent to anyone else, that Arkema allows, endorses or permits the use of Arkema products in such medical devices. Further, all implantable medical devices, whether permanent or temporary, carry a risk of adverse consequences. With regard to implantable medical devices, you should not rely upon the judgment of Arkema. Any decision regarding the appropriateness of a particular medical device in a particular medical application or for a specific clinical use should be based upon the judgment of your physician, medical device supplier and the United States Food & Drug Administration and/or the European process of Medical Device notification. Unless otherwise specifically stated by Arkema in writing, Arkema does not perform clinical medical studies on implantable medical devices. Arkema cannot weigh the benefits against the risks of a device and does not offer a medical judgement on the safety or efficacy of use of any Arkema product in a medical device.

Altuglas® and Altuglas® Luctor are combustible acrylic thermoplastics. Observe fire precautions appropriate for comparable forms of wood and paper. For building uses, check code approvals. Impact resistance is a factor of thickness. Avoid exposure to heat or aromatic solvents. Clean with soap and water. Avoid abrasives.

The statements, technical information and recommendations contained herein are believed to be accurate as of the date hereof. Since the conditions and methods of use of the product and of the information referred to herein are beyond our control, Arkema expressly disclaims any and all liability as to any results obtained or arising from any use of the product or reliance on such information; NO WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE, WARRANTY OF MERCHANTABILITY, OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, IS MADE CONCERNING THE GOODS DESCRIBED OR THE INFORMATION PROVIDED HEREIN. The information provided herein relates only to the specific product designated and may not be applicable when such product is used in combination with other materials or in any process. The user should thoroughly test any application before commercialization. Nothing contained herein constitutes a license to practice under any patent and it should not be construed as an inducement to infringe any patent, and the user is advised to take appropriate steps to be sure that any proposed use of the product will not result in patent infringement.

See MSDS for Health & Safety Considerations.

We manufacture and market PMMA resin and sheet products under the brand name Plexiglas® in North and Latin America, and under the brand name Altuglas® in Asia Pacific, Europe, Africa and the Middle East. Altuglas® and Plexiglas® are registered trademarks and Luctor is a trademark of Arkema.