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## 2. COMPOSITION/INFORMATION ON INGREDIENTS

### Product Description

A high molecular weight acrylic sheet used in a wide range of applications.

Polymethyl methacrylate : greater than 90%

CAS No: 009011-14-7

Hazardous Ingredient(s)	CAS No.	EC No.	EC Classification
Not classified as hazardous ingredient(s)			

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## 3. HAZARDS IDENTIFICATION

Under normal conditions of handling and use, this product is not expected to create any unusual industrial hazards. Care should be taken when thermoforming to ensure that the product is not exposed to temperature exceeding 200°C.

### Primary Route Exposure

Eyes contact	: No hazard expected in normal use. Possible slight mechanical irritation by fine particles when machining product.
Skin contact	: Material can cause cuts when using cut sheets.
Inhalation	: No hazard expected in normal use. Possible slight mechanical irritation by fine particles when machining product.
Ingestion	: No hazard expected in normal use.

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## 4. FIRST-AID MEASURES

Eye Contact	: In case of irritation from fine particles during machining : flush eyes with eyelids retracted with plenty of water and consult a physician if irritation persists.
Skin Contact	: No specific treatment is necessary since this material is not likely to be hazardous.
Inhalation	: In case of prolonged irritation from fine particles when machining consult a physician.
Ingestion	: Ingestion is not considered a potential route of exposure.

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## 5. FIRE-FIGHTING MEASURES

Flash Point	: above 250°C
Auto Ignition Temperature	: above 400°C
Flammability limits	: not applicable
Extinguishing Media	: Water spray, foam, dry chemical, carbon dioxide
Fire Fighting Protective Equipment	: A self contained breathing apparatus and suitable protective clothing should be worn in fire conditions.

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## 6. ACCIDENTAL RELEASE MEASURES

### Procedures

Collect material and place in a disposal container. Obey relevant local, state, provincial and federal laws and regulations.

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## 7. HANDLING AND STORAGE

### Handling

These sheets are heavy and unwieldy. They should be handled with care, particularly in windy locations or outdoors. If broken or chipped, the resultant edges can be sharp and cause cuts to skin and eyes.

During thermal processing and/or machining, local exhaust ventilation at processing machine is necessary.

Take precautionary measures against static discharges.

### Storage

Keep away from sources of ignition. Protect from exposure to fire and heat.

Storage Temperature : Below 40°C

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## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Provide adequate ventilation, including appropriate local extraction if dusts, fumes or vapors are likely to be evolved.

Consideration should be given to the work procedures involved and the potential extent of exposure as they may determine whether a higher level of protection is required.

Local extraction close to the cutting head must be used when laser cutting. Where suitable engineering controls are not fitted or are inadequate, wear suitable protective equipment.

The following information is given as general guidance.

Respiratory protection	: In case of dust formation when machining wear dust mask
Engineering control (ventilation)	: Local exhaust should be used when machining. If machining operations generate dust, use adequate ventilation.
Eye Protection	: Wear eye/face protection. Safety spectacles/goggles/full face shield.
Hand Protection	: Sharp edges may cause cuts. Wear suitable gloves against mechanical risks.
Other protective equipment	: Wear suitable protective clothing.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

Form	: sheet
Odor	: odorless
pH (Value)	: Not applicable
Boiling Point (°C)	: Not applicable
Auto Ignition Temperature (°C)	: above 400°C
Explosive Properties	: Not explosive
Oxidizing Properties	: Not oxidizing
Vapour Pressure (mm Hg)	: Not applicable
Vapour Density (air =1)	: Not applicable
Specific Gravity (water =1)	: 1.19
Solubility in Water	: insoluble
Partition Coefficient	: Not applicable
Decomposition Temperature (°C)	: Will not decompose below 200°C.
Freezing Point (°C)	: Not applicable
Softening Point (°C)	: above 100°C
Viscosity (dynamic)	: not applicable

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## 10. STABILITY AND REACTIVITY

Stability	: No decomposition if stored and applied as directed
Incompatibility with other materials	: None reasonably foreseeable
Hazardous Polymerization	: No hazardous reactions known
Hazardous Decomposition Product(s)	: In case of thermal decomposition, combustible vapors are formed, which are irritating to eyes and respiratory system, mainly consisting of: methyl methacrylate
Condition to avoid	: This product is chemically stable

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## 11. TOXICOLOGICAL INFORMATION

### Further Information on Toxicology

The product has not been tested toxicologically. When handled and used as directed the product will not cause hazardous effects to health according to studies on similar products and practical experience.

## 12. ECOLOGICAL INFORMATION

This environmental hazards assessment is based on information available on similar products.

### Environmental Fate and Distribution

Medium tonnage material used in partially contained systems. Solid with low volatility. The product is essentially insoluble in water. The product has low potential for bioaccumulation. The product has low mobility in soil.

Heavy metal based pigments will not leach from waste material.

### Persistence and Degradation

The product is non-biodegradable in soil. There is no evidence of degradation in soil and water.

### Effect on Effluent Treatment

Unlike to have an effect on effluent treatment systems. The material is essentially insoluble in water and can therefore be separated from aqueous medium by sedimentation and filtration processes at an effluent treatment plant.

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## 13. DISPOSAL CONSIDERATIONS

Disposal should be in accordance with local, state or nation legislation. Incineration may be used to recover energy value.

Bury on an authorized landfill site or incinerate under approved controlled conditions, using incinerators suitable for the disposal of noxious chemical waste.

Large quantities of waste may be recoverable. Contact supplier for specialized advice.

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## 14. TRANSPORT INFORMATION

Not classified as dangerous for transport

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## 15. REGULATORY INFORMATION

Not classified as dangerous for Supply/Use.

EC Classification

: Under the classification, Packaging and Labeling of Dangerous Substances Regs, 1984, this material is not dangerous for supply or conveyance.

### **Storage**

ASTARIGLAS® sheet should be stored in a cool dry conditions, either horizontally on pallets or vertically in fully supporting racks. Avoid storage in high humidity conditions or in direct sunlight.

### **Exposure to Heat**

ASTARIGLAS® sheet tends to deform when heated up to 100°C. ASTARIGLAS® sheet should be stored in area whose ambient temperature does not exceed 80°C.

### **Mechanical Damage**

ASTARIGLAS® sheet has relatively high surface hardness, however care should be taken to avoid surface scratching during handling. Both surfaces of ASTARIGLAS® sheet are protected with masking film or paper. It is recommended not to remove the masking until it is necessary.

### **Cleaning**

Wash ASTARIGLAS® sheet with a solution of mild soap or detergent with lukewarm water. Use a clean soft cloth, applying only light pressure. Rinse with clean water and dry by blotting with a damp cloth or chamois. Grease, oil or tar may be removed with a good grade of hexane, aliphatic naphtha, or kerosene. These solvents may be obtained at a paint or hardware store and should be used in accordance with manufacturer's recommendations.

DO NOT USE: window cleaning sprays, kitchen scouring compounds or solvents such as acetone, gasoline, benzene, alcohol, carbon tetrachloride, or lacquer thinner. These can scratch the sheet's surface and/or weaken the sheet causing small surface cracks called "crazing."

It is not recommended to use abrasive cleaners on the sheet surface.

### **Dusting**

Dust with a soft, damp cloth or chamois. Dry or gritty cloths may cause surface scratches and create a static electric charge on the surface (see the section on neutralizing static electricity).

### **Polishing**

Protect ASTARIGLAS® sheet and maintain its surface gloss by occasional polishing with a good plastic cleaner and polish. Apply a thin, even coat with a soft clean cloth and polish lightly with cotton flannel. Then wipe with a damp cloth to help eliminate electrostatic charges that can attract dust particles.

### **Removing Scratches**

Fine scratches can be removed by hand polishing. Apply a plastic scratch remover to a soft flannel pad and rub. When the scratches have disappeared, remove all residue and polish. For deeper scratches, first sand lightly with a 400-grit "wet or dry" sandpaper, using plenty of water and rinsing the sandpaper frequently. Follow by buffing with a clean muslin wheel and a good polishing compound. For the highest gloss, use a clean-up wheel made of soft cotton or flannel sections and on which no compound is used.

### **Solvent Attack**

ASTARIGLAS® sheet can be attacked by organic solvents resulting micro cracks / crazing formed in the sheet surface. It should be avoided to store ASTARIGLAS® sheet in such area which may be exposed to solvent vapors.

### Thermal Expansion

ASTARIGLAS® sheet has a fairly large coefficient of thermal expansion. Thermal dimensional changes should be taken into account in processing and storing it. For example, an increase or decrease by 10°C in the sheet temperature may cause 0.7 mm of linear expansion or shrinkage per 1.000 mm in length of the sheet.

### Water Absorption

Humidity also causes dimensional changes of ASTARIGLAS® sheet. Though such changes by humidity are not as much as Thermal Expansion, humidity conditions should be carefully watched. Water absorption, if excessive, may lead to bubbling during thermoforming or crazing after printing or painting. It is therefore recommended that storage and working areas should be air-conditioned.

### Fire Combustion

ASTARIGLAS® sheet with ignition temperature of 400°C is not highly flammable, but the sheet will be burned when exposed to naked fire.

### Storage Positioning

ASTARIGLAS® sheet can be stored either horizontally or vertically. The sheet can warp depending on the way it is stored. Either of the following is recommended.

#### Standing:

Stand ASTARIGLAS® sheet on the rack with bottom inclined at 10-degree angle. (See Figure A.) Place the sheets tight to each other. It is recommended to keep the total thickness of a cluster of sheets within 30 cm.

#### Stacking:

Stack the sheets flat. In case sheets of different sizes are stacked, avoid an overhang with the smaller size sheet always placed on top of the larger ones. (See Figure B.) Also the total height of a stack should not exceed 50 cm. A stack consisting of the same size of sheets is much preferred.

Figure A

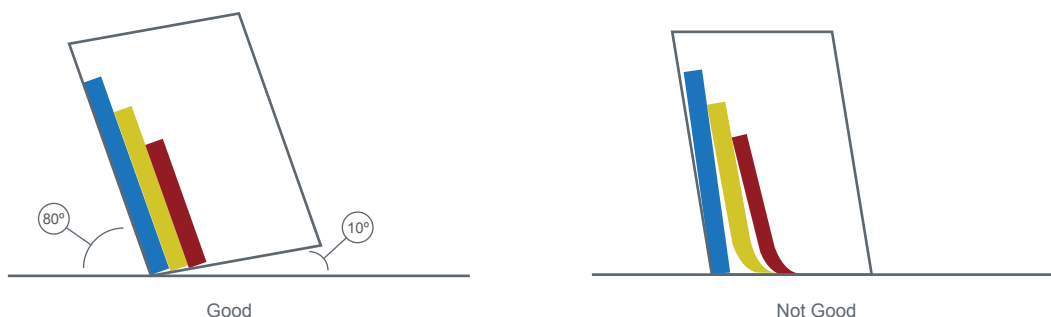


Figure B



Bowing or warping of acrylic sheet can be caused by several factors:

### 1. Moisture absorption and Temperature changes

ASTARIGLAS® cast acrylic sheet is dimensionally stable material, but with changes in humidity and temperature, slight changes in dimension may occur.

- Bowing due to humidity differences

Like most other plastics, cast acrylic sheet is slightly hygroscopic (water absorbing) and therefore will absorb moisture from the surroundings, possibly causing dimensional changes. The change in dimension caused by a change in humidity does not occur instantaneously. It occurs gradually over time exposed to a humid environment. This will require a period of time for the sheet to equilibrate, restoring its original dimensions. The higher the change in humidity then longer it will take for acrylic sheet to reach dimensional equilibrium. For example, when the humidity change is small (10% to 30% relative humidity differential), small dimensional change will occur within 15-30 days. If the change in humidity is large (>60% relative humidity differential), then as long as 70 days may be required for the sheet to reestablish dimensional equilibrium. The time required for thicker sheet to reach equilibrium is longer, for thinner sheet it is shorter.

Under normal atmospheric conditions, acrylic sheet contains about 0.5% water. When the sheet is exposed to high or low humidity, the water content will change, which results in dimensional changes. When the top and bottom side are exposed to different levels of relative humidity, the dimensional change will cause the sheet to bow in the direction of the more humid atmosphere.

- Bowing due to temperature differences

If two surfaces (top and bottom side) of cast acrylic sheet are exposed to different temperatures, the two surfaces will contract (expand) at different rates and the sheet will bow. The direction of the bowing will be toward the higher temperature.

- Combined effects of temperature and humidity

In practice, cast acrylic sheets are usually exposed to both temperature and humidity differentials simultaneously. Under these conditions, the sheet will bow even more because of the cumulative effects of temperature and humidity differentials.

If the top and bottom side of the sheet are exposed to different temperatures and humidity, the surface exposed to the higher temperature and higher humidity will expand more than the opposite surface, and the sheet will bow.

### 2. Improper Storage

Proper storage of cast acrylic sheet is the most important factor in minimizing bowing. Cast acrylic sheet stored flat on a solid surface will relax over time even if previously bowed due to a variety of causes. All sheets should be stored flat at all times. If sheets are stored on uneven surfaces, they will 'cold form' or take the shape of the uneven surface. The longer they remain in that state the more difficult for the sheet to return to its original flat state. Standing the sheets vertically or leaning them against a wall or rack will typically cause a 'cold form' as well.

### 3. How to minimize bowing or warping?

- Keep the pallet and sheets away from rain and moisture especially during delivery and unloading
- Store the sheets in ambient temperature, preferably in low humidity environment with original packaging, closed and protected as much as possible. Sheets should be stored on flat, even surface at all times.
- Employ FIFO logistics management system

## Bowing Advisory for Cast Acrylic Sheet

- Remaining sheets should be rewrapped with original PE plastic wrap and put back into original cardboard packing. They should be stored on flat
- Manage logistics in order to minimize time that the product is in transit.

### **4. How to fix the warped sheet?**

- Place the sheets on a flat surface in a warm room. If possible, place an even weight over the entire surface by placing additional sheets on top of the bowed sheet to hold it in place. Allow the sheet to remain under this weight for approximately 24 hours, then move to a cooler location with the weight remaining on top and allow it to cool for at least another 24 hours.

### **Action from Astari part**

- o Ensure proper packing after production.
- o Ensure compliance with FIFO management system.

### **Suggestion for customers**

- o For a proper storage suggestion see Handling and Storage section.
- o Protect acrylic sheet and the packaging from direct contact with liquids especially during unloading and delivery.
- o After opening a pallet, please rewrap the remaining sheets on the pallet