

# Operating & Maintenance Instructions

## 320 Dome Blowing Unit

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# 1. On Delivery

Upon delivery, carefully unpack your new dome blowing unit and ensure that it has arrived in good condition. Any obvious transit damage must be reported promptly to us and the carrier. Position the dome blowing unit at a convenient working height.

The height gauge has been supplied loose for ease of transport. To fit, screw the threaded end of the gauge in its mounting hole in the outer ring (positioned at approximately 11 o'clock when looking from the front of the machine). Tighten using the 10mm nut. Set using a tape measure or steel rule. As a guide, set the height gauge to the radius of the ring being used (i.e. when using a 150mm ring, set the gauge to 75mm).

The air supply should be connected to the push-in fitting on the left hand side of the machine. This fitting will accept 8mm OD pneumatic tubing. When inserting the tube, two "clicks" will be felt, the first as the collet in the fitting grips the tube, and the second as the internal O ring in the fitting seals onto the tube. Always fit and remove tubes with the air supply off. To remove a tube, firstly push the blue collet and the tube into the fitting. Then, still holding the collet in, remove the tube.

When using a compressor to run the Dome Blowing Unit, fit the blue plug supplied into the fitting on the right hand end of the machine, this prevents air escaping when the Unit is idling. N.B. Air pressure should be regulated to 2 bar (30psi) when using a compressor, to limit the inrush of air.

When using a vacuum forming machine to run the unit, the blue plug should be removed as described above for the pneumatic tubing, as the pump needs air flowing through it when idling for correct operation.

## 2. General Information

Cast Acrylic is the preferred material for this thermoforming process as it has excellent elastic characteristics over a temperature range of approximately 70°C and the memory capability of cast material allows the use of the same piece of material several times over. PVC should perform quite well as it is similar in behaviour to cast acrylic. It will be found that attempts to free blow polystyrene, extruded acrylic, ABS, polycarbonate and such materials with a dominant plastic range will result in uneven shapes. The uniformity of a dome is dependent upon the elastic quality of the plastic preventing "runaway" extension as a local area thins during the blowing process with subsequent loss of tension.

The material will need to be preheated in an oven, which should be set at 150-165°C (302-329°F). Select and fit the desired ring. The largest 300mm (12") ring stays in position at all times, with the smaller rings being fastened inside using the four M6 handwheels supplied. While not in use, these handwheels can be retained in the four tapped holes in the aluminium top plate. Prepare a suitable piece of cast acrylic or PVC. Surplus material is required for clamping and minimum dimensions are given in Fig. 1 overleaf for each dome option.

### 3. Dome Blowing Technique

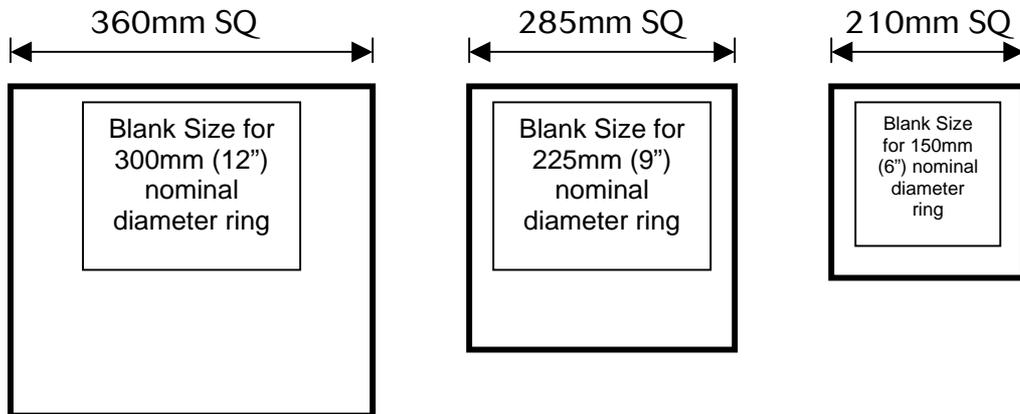


Figure 1

Adjust the pressure of the toggle clamps to provide a gentle 'over centre' pressure on a piece of material 2mm thinner than the selected material for the dome. This can be achieved by using a piece of vacuum forming polystyrene of, say, 1.00mm thickness for 3.00mm cast acrylic or two thicknesses of 2.00mm for setting clamp pressure for 6.00mm material. The toggle clamp adjustment screws are locked by the two lock nuts but the stud end is intended to float in the clamp ring to permit precise seating on the workpiece without inducing unnecessary stress. Note that the threaded holes in the clamping rings are inserted to resist wear.

When clamping the actual workpiece, which will be in its thermoplastic state, a small amount of material will be impressed and additional force will be required on the toggle clamps than that exerted at the setting stage. If facing front and rear clamps are locked at the same time, the forces required to clamp are opposing and the process can be achieved quite smoothly, remembering that the available time to complete the process is limited to about 30-60 seconds. Allow at least 10 minutes soak time in the oven, after operating temperature has been attained, for 3mm material, and about 20 minutes for 6mm material.

After the appropriate pre-heating period check that the toggle clamps and clamping ring are released and ready to accept a heated sheet. Using heat proof gloves remove the heated sheet from the oven and place centrally on the silicone rubber pad, clamp in position and press the blow button. Blow until within 6mm (1/4") of the height indicator. It will be observed that slight further expansion takes place as the incoming cold air absorbs heat from the hot plastic and increases slightly in pressure.

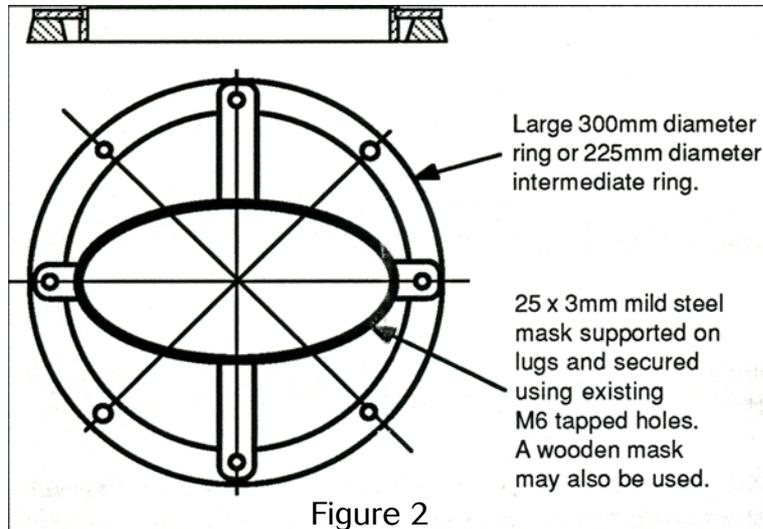
Take care not to extend beyond a true hemisphere as the material will, thereafter, attempt to adopt a spherical shape and the diameter immediately above the clamping ring will be larger than the ring ID making removal impossible. In this event both ring and workpiece can be returned to the oven at the set temperature and the material will recover. Observe dome height whilst cooling and momentarily select blow if the dome shows any tendency to shrink during the cooling cycle. It is quite permissible to apply the blow mode continuously as the dome cools through the freeze point, no significant

pressure will be accumulated as the clamp frame will lift and release the air at approximately 1 bar (15psi). For information the pressure required for the dome blowing operation is, typically, 0.66 bar (10psi).

Note that any tendency by the material to split or tear indicates overheating, the material will exhibit superior "elastic" qualities at the lower thermoforming temperatures.

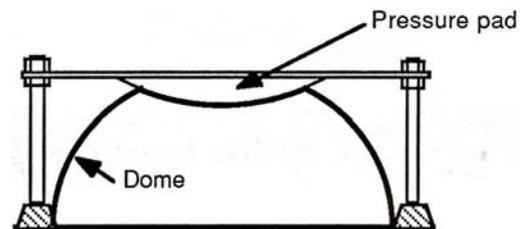
## 4. Other Shapes

Whilst the dome blowing unit in its basic form can only produce circular forms, easily produced skeleton "masks" or frames can be fabricated (see Fig. 2) to control or modify the shapes produced. A pressure pad may also be placed, suitably shaped, on



top of the dome to produce a concave base, (see Fig. 3). Note that success will be more certain if the supplied rings are relied upon to create the air seals and the fabricated masks only serve to modify the shape of the workpiece. Although this will inevitably involve some increase in material wastage, reliable air sealing does require precision and rigid clamping frames as supplied in the form of the cast aluminium units.

A tall "clock" style dome shape can be produced by placing a rolled cylinder equal in internal diameter to the ID of the clamp ring over the proposed dome thus preventing the tendency to develop towards a spherical shape prohibiting removal from the clamp ring. The internal face should be smooth and free of possible marking scars and it must be remembered that thinning of the top dome will increase with height. PVC with its weaker elastic characters will possibly be more successful if taller domes are required.



## 5. Machine Maintenance

Your Model 320 Dome Blowing Unit should provide many years of trouble free use. The unit is very robust in construction, and will require minimal regular maintenance. Periodically oil the toggle clamps to ensure continuing smooth operation. The silicone seal has been directly cast onto the aluminium top plate to ensure maximum adhesion. Should the seal begin to lift around the edges, or be torn for any reason, a very effective repair can be carried out using normal silicone sealant. When carrying out this type of repair, always ensure that the surfaces being joined are thoroughly cleaned beforehand using methylated spirit. Methylated spirit can also be used for cleaning of the silicone seal.