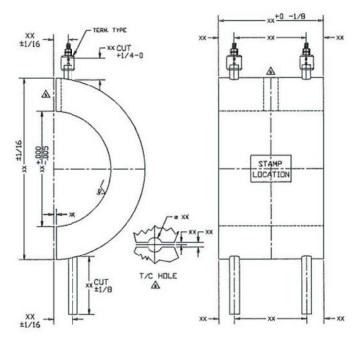


TECHNICAL BRIEF

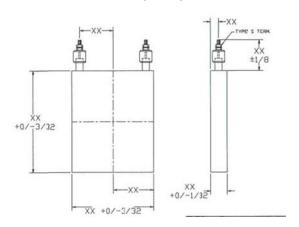
CAST-IN HEATERS STANDARD DIMENSIONAL TOLERANCES

Permanent mold cast-in aluminum heaters can be produced with a variety of surface finishes, dimensional tolerances, draft angles, etc. The objective for every cast-in heater design is to make a part with dimensional tolerances that are acceptable in the application, yet not too stringent that manufacturing and reject costs become excessive. This technical brief will outline the Durex standard dimensional tolerances that are recommended for most applications. Many of these tolerances can be tightened, but the result will be a more expensive cast-in heater.

DIMENSIONAL TOLERANCES ON CAST-IN BAND HEATER DESIGNS



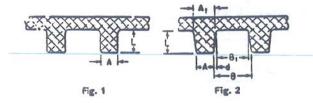
DIMENSIONAL TOLERANCES ON FLAT PLATEN SHAPES



DRAFT ANGLES

Walls and surfaces that are perpendicular to the parting line plane require draft or taper so that the casting can be extracted from the mold. The required draft is not a constant. It will vary with the length of draw (L) for most designs with a draw of 1" or more, a draft angle of 3° to 5° is adequate. For shorter draws under 1" length, a 7° draft angle is required. Draft is not required on platens or pressure cast band heater designs.

Normally, the drawing does not show draft (Figure 1). Standard foundry practice is to add draft to the part. This is synonymous with saying it will add metal to the casting, thereby increasing its size and weight. Draft "d" will be added to "A", increasing its size to " A_1 ". Note that the added draft affects dimension "B" by decreasing its size to "B". This is shown in Figure 2.

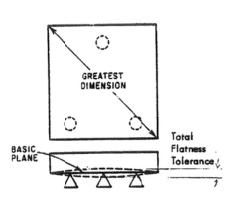


For holes, draft will be "added" to "a", decreasing its size to " a_1 ", as shown in Figure 3. When designer desires a hole dimension to become larger for reasons such as clearance, he should indicate so.



FLATNESS TOLERANCES

Flatness is that condition which exists when all points on a surface lie in the same plane. The surface of a casting can be measured for flatness by supporting the surface in question on three widely separated points to establish the basic plane.



Surface	Greatest Dimension	Flamess Tolerance
As Cast	0 thru 6" Ea. additional in.	Within .030 in. .003 in/in
Belt Sanded	0 thru 6" Ea. additional in.	Within .015 in. .002 in/in
Machined	0 thru 6" Ea. additional in.	Within .005 .001 in/in

DIMENSIONAL TOLERANCES ON DRILLED HOLES

1. Hole Diameter

Up to ¾" + .010

- .000

13/16 to 1.0 +.015

-.000

Reamed Hole ± .002

2. Hole Location

No Drill ± .040 from 2 specified edges

For tolerances tighter than \pm .040, a drill fixture is normally required which the customer must pay for.

POROSITY AND SHRINKAGE

While permanent mold casting generally produce higher quality parts, porosity and shrinkage can occur. This occurs due to entrapped air or other impurities and is generally around the heating elements or cooling tubes. Areas of volumetric shrinkage smaller than 1 square inch and no deeper than .06" at any point will be acceptable. Any single visible hole over .06" in diameter or depth will cause the casting to be rejected. More than 5 holes between .03" and .06" on any casting surface will cause rejection. Holes smaller than .03" in any number will be acceptable. In addition, no visible cracks greater than .015" wide and/or 1" in length will be acceptable.

GATES, RISER, CHILL MARKS

Castings with straight sides will normally be de-gated by using an abrasive cutoff wheel. This produces a straight mill finish appearance. Unless otherwise specified, no further finishing will be done by the foundry.

Castings with curved gates or complex contours which are not readily adaptable to being de-gated by the abrasive wheel will be band sawed to within 1/16 of the casting surface. They will then be belt sanded (36 grid) flush with the casting surface.

Keep in mind that all of the tolerances listed are Durex normal standards. Generally, these can be improved upon at additional cost, if they are brought to our attention when the job is quoted.