In-Mold Electronics (IME) Printed Heaters

Tech Sheet

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What are IME printed heaters?

In-mold electronics heaters use the same processes as in-mold decorated products. The forming process involves placing a screen printed appliqué – a pre-made form made from a printed sheet of plastic, which is formed and cut to size – into an injection mold and molding behind and around the appliqué. In the case of a printed heater, a silver conductive ink is printed instead of a decorative applique.

How do IME printed heaters work?

IME printed heaters are a resistive heating element which works the same way your toaster or rear defroster works. Current is sent through the printed conductive silver tracings and the resistance is converted to heat.

Front of Lens Heater

Back of Lens Heater

Advantages

- Heater integrated into molded resin
- No adhesive required
- Robust and durable construction
- Can be incorporated into 3D shapes
- Saves space
- Cost savings can be achieved

TYPICAL APPLICATIONS

- Industrial equipment
- Automotive
- Test equipment
- Simulation and experimentation
- De-icing and warming
- Anywhere resistive heaters are currently used

DESIGN OPTIONS

SIZE and GEOMETRY - Maximum forming size 14" x 16" with 1.38" draw depth

TEMPERATURE RANGE - Maximum Temperature 270 degrees F (if using Polycarbonate)
The temperature can be regulated on an IME printed heater using set points and a controlled heat range.

CONNECTOR OPTIONS - Works with standard electronic connecting options

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3M Preferred Converter
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FILMS FOR IMD

Polycarbonate

- Excellent formability
- Variety of finishes/textures/hardcoats
- Multiple gauges available

Acrylic

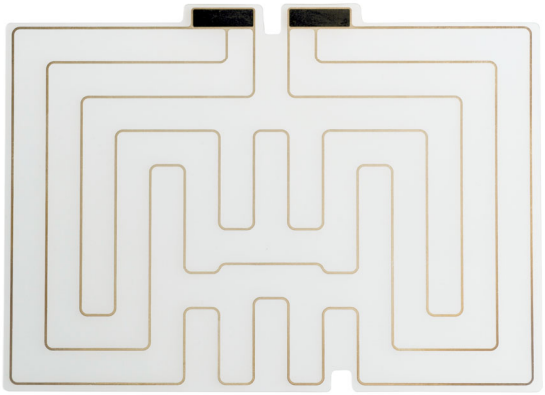
- Improved UV resistance over PC
- Up to 2H pencil hardness

Polyester

- Excellent chemical resistance
- Limited formability; n/a in gauges > 10 mil

Blends/Laminates

- PC/PET, textured, limited gauges, large minimum order
- PC/Acrylic, large minimum order, longer leads



COST CONSIDERATIONS

Thickness of material
Standard matte/pre-textured finishes vs gloss
Preformed vs flat

IMD FORMING GUIDELINES

Undercuts are not possible

Draft angles

3° minimum, 5° preferred for perimeter of part
1.5° minimum, 2° preferred for internal holes

Radii recommendations

1x material thickness for inside radii (inside of bend)
2x material thickness for outside radii (outside of bend)

Openings (internal holes)

Form film at least half way down opening to improve registration in mold

Trimming Assistance

Form in a flat flange to aid in top down trimming (avoids use of side action tooling which can be more expensive)

Draw Limitations

Varies by type of forming

Design Considerations

One variable that should be considered with IME heaters is the coefficient thermal expansion (CTE) of both the substrate and the molding resin. Since by design, we are heating and cooling the parts. If the CTEs are not matched, the risk of delamination will be greater. The size of the part would also determine how critical matching the CTE is.