

Therma Klear™ Series Dontech Transparent Heaters

Dontech Therma Klear Series transparent heaters provide a temperature control for the operation of LCD's (Liquid Crystal Displays) in cold environments and for anti-fog, anti-icing, and de-icing applications. Using optically clear, conductive coatings, Dontech's heaters are available in a variety of substrates (e.g., glass, acrylics, polycarbonates, polyester) in custom shapes (typically rectangular) and sizes (up to 42 in. diagonal).

High light transmission (up to 99%) enables heater performance in display applications such as avionics, rugged computers, transportation and handheld electronics. Dontech heaters enable LCD operation to below -40°C for outdoor applications such as military computers, gas pumps, kiosks and handheld devices. Dontech's power lead attachment technique provides a durable, mechanical wire attachment to the heater buss. Heaters can be configured for mounting in front or behind the display.

Standard Heater Specifications:

- Substrates - glass (e.g., soda lime or borosilicate glass), acrylic, polycarbonate or polyester
- Sizes from 1.0" to 42.0" diagonal. Thickness available from .007" to 1"
- Shapes - rectangular, square, flat, formed
- Resistance - 5 ohms/sq. to 350 ohms/sq.
- Uniform and consistent heating over wide thermal range

Custom Heater Specifications:

- Index matched ITO coatings for maximum light transmission up to 99%
- Custom wire attachment via Dontech proprietary attachment process
- Buss bar options: sputtered metals, fritted (ceramic), solderable, metal loaded, acrylic, polyester, and epoxy
- Can be equipped with thermo sensors and controllers for temperature regulation
- Dontech can optically bond transparent heaters to touchscreens and front or rear surface of LCD's
- Transparent heaters can be configured to provide EMI/RFI shielding of LCD's


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Therma Klear™ Series

Dontech Transparent Heaters

Transparent heaters refer to visually transparent substrates with electrically conductive coatings. When power is applied across the panel it generates heat. Typical applications for transparent heaters include electronic displays which require a minimum operation temperature, anti-fog, anti-icing, and de-icing windows.

Dontech utilizes our **VC Series** of conductive coatings for transparent heaters. They offer a wide range of resistances all of which can be cost effectively applied to most standard optical substrates. These coatings are neutral in color and high in light transmission, ideal for both monochromatic and color applications. Surface reflections can be minimized and transmittance can be maximized by index matching the conductive coating to air or lamination adhesives. Light transmission can exceed 99%.

VC is Dontech's designation for vacuum deposited visually transparent conductive coatings. The prefix is followed by the number for the specific type of coating and the maximum resistance, measured in ohms per square. For example, a VC1-15 is a conductive ITO coating which has a maximum resistance of 15 ohms per square. For more demanding applications, resistance ranges can be specified in either wire to wire values or tolerated resistance of the conductive coating.

Standard Dontech's VC Series

Coatings for transparent heaters are as follows:

Standard Coatings	Maximum Resistance	Nominal Unenhanced Transmittance	Nominal Enhanced Transmittance
VC1-5	5	80%	88%
VC1-10	10	82%	90%
VC1-15	15	85%	93%
VC1-25	25	83%	91%
VC1-60	60	86%	94%
VC1-80	80	81%	89%
VC1-100	100	81%	89%
VC1-150	150	83%	91%
VC1-350	350	89%	97%

Note: Transmittance values will vary with enhancements and substrates. Please contact a Dontech Sales Engineering Representative for design information specific to your application.

The proper resistance range of the panel is best determined from the heating power required, the source of applied voltage, and the intended use (e.g., antifogging). Power required is determined in watts per area. Recommended power densities are from 0.1 to 5.0 watts per square inch.

R = VC Coating resistance (ohms per square)

R_L = Approximate line (i.e., assuming no resistance from the buss bars, wire & connectors) or wire to wire resistance (ohms)

E = Applied voltage (volts)

P_D = Power density (watts per square inch)

P_T = Total power of the system (watts)

L = Length of conductive coating (inches)

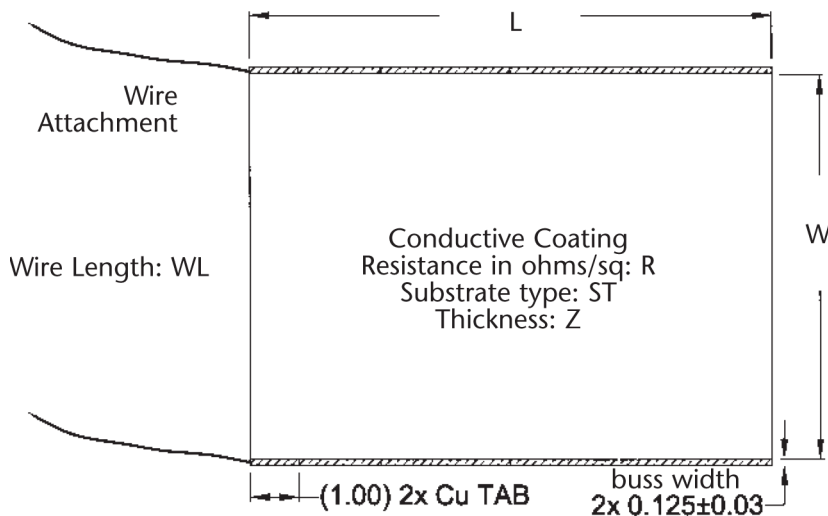
W = Width (i.e., separation between buss bars) of conductive coating (inches)

Equations:

$$P_D = \frac{E^2}{RW^2}$$

$$R_L = \frac{RW}{L}$$

$$P_L = \frac{E^2}{R_L}$$



Engineering Drawing of a Typical Dontech Heater

Good electrical contact with the conductive surface is established with two buss bars typically formed with conductive paints. The buss bars should be located parallel to one another on opposite sides of the panel. Lead terminations can be incorporated into the buss bars for ease of connection to the power supply and controller.

Dontech is an ISO-9001 certified designer and manufacturer of optical and EMI/RFI filters and contrast enhancement filters for electronic displays.

For demanding requirements or for more information, please contact a Dontech Sales Engineering Representative at (215) 348-5010.