

## Technical Information

# KOARMISTOR SERIES 7400

## BLENDABLE PTC THERMISTOR COMPOSITIONS

The 7400 series PTC compositions were developed primarily for temperature sensing and compensation applications. However, their ability to withstand high voltage and moderately elevated temperatures makes them useful for self regulating heating elements, as well. Key features of the system include:

- RoHS Compliant
- Wide Resistivity Range
- High TCR
- Linear Temperature Dependence
- Firing in Standard 850°C Profile
- Compatibility with Ag:Pd and Gold Termination.
- Passivation with Low Temperature Overglaze.

### TYPICAL FIRED FILM CHARACTERISTICS<sup>(1)</sup>

	<b>7400</b>	<b>7401</b>	<b>7402</b>	<b>7403</b>	<b>7404</b>
<b>Resistivity</b> <sup>(2)</sup> Ohms/Square	1 ± 20%	10 ± 10%	100 ± 10%	1,000 ± 10%	10,000 ± 20%
<b>TCR</b> ppm/°C , + 25°C to +125°C	3600 ± 200	3400 ± 200	3200 ± 200	3000 ± 200	2800 ± 200
<b>Stability</b> <sup>(3)</sup> %Change, 250 hrs@150°C	< 1.0	< 0.2	< 0.2	< 0.2	< 0.2

- (1) Typical properties are based on testing of several batches under various processing conditions. They are not intended as specification limits.
- (2) The electrical results are based on 1mmx1mm pads, fabricated with 7400 series thermistors and 6261 palladium- silver termination. All firing done in a standard 36 minute furnace profile with 10 minutes at 850°C.
- (3) Glazed with KOARTAN 5650 overglaze, 500°C.

### COMPOSITION PROPERTIES

**Viscosity:** 120 - 180 Kcps, when measured with Brookfield HBT viscometer, Spindle #14, utility cup, 10 RPM, 25°C

**Specific Gravity:** 2.0 - 2.4 g/cm<sup>3</sup>

**Recommended Thinner:** KOARTAN A-1039

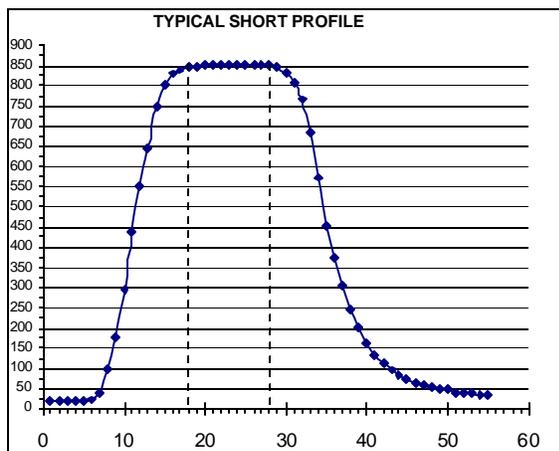
## RECOMMENDED PROCESSING PROCEDURE

**Printing:** For best results, printing with a 280 mesh stainless steel screen with 10-15  $\mu\text{m}$  emulsion and 45 degree angle is recommended. A dried thickness of 20-24 microns is specified. Other mesh counts, 200-325, and emulsion thicknesses, 5-25  $\mu\text{m}$ , may be used for special applications.

Coverage is approximately 110  $\text{cm}^2/\text{g}$ , when utilizing a 280 mesh screen and a wet print thickness of about 40  $\mu\text{m}$ .

**Drying:** Wet prints should be allowed to level for 5-10 minutes prior to drying. Dry for 10-15 minutes in a convection oven or belt dryer at 125°C-150°C.

**Firing:** Firing in air using a belt furnace and a 36-60 minute profile, with 10 minutes at a peak temperature of 850°C, is recommended. Air flow rates must be optimized to ensure that the products of binder burn-off discharge properly and create a fully oxidizing atmosphere in the muffle.



*Temperature (°C) vs. Time (minutes)*

**Application Notes:** The 7400 series thermistors may be protected using a variety of overglazes. Typical resistivity shifts on glazing with KOARTAN low temperature glaze 5650, fired at 500°C, are shown below:

7400	7401	7402	7403	7404
20-25	3-5	<1	<1	<1

Lager, but predictable, shifts result as the glaze temperature increases. KOARTAN's acid resistant glaze 5600 and lead-free dielectric 5807 may be used (600°C and 850°C firing, respectively). All shifts are positive, i.e. increased resistance upon glazing.

Refiring the thermistors without a glaze would result in negative resistance shifts. These shifts must be documented and taken into account if two or more members are printed and fired sequentially on the same substrate.

**Storage and Shelf Life:** Store in tightly capped containers at room temperature. Shelf life is 6 months for unopened jars. Thorough mixing of the paste before each use is recommended. Under ordinary conditions of storage and use the product should not require thinning. However, solvent loss during extended printing runs may be corrected by incorporating up to 0.5% of KOARTAN A-1039 thinner.

The information presented herein is based on data believed to be dependable and is accurate and reliable to the best of our knowledge and belief, but not guaranteed to be so. Koartan Company assumes no liability arising from the use of this product or the information provided herein. It is the responsibility of the user to verify the information and to establish the suitability of the product(s) for any particular application. Nothing herein is to be construed as recommending any practice or any product in violation of any patent or in violation of any law or regulation.