

Micromax™ 4311

Electronic Inks and Pastes

1Ω/sq - 1MΩ/sq Resistors For Cermet Trimmers And Potentiometers

Micromax™ 4300-Series Resistors are cadmium free* and designed for use in high performance cermet trimmers and potentiometers. Micromax™ 4300-Series Resistors are intended to be applied to ceramic substrates by screen printing and fired in a conveyor furnace in an air (oxidizing) atmosphere, to form specific resistive elements.

Product benefits

- Cadmium free*
- Improved low ohm performance
- Suitable for various wiper materials including stainless steel
- Excellent contact resistance variation (CRV), rotational life, and solder dip stability
- Compatible with high silver containing conductors
- Fast Firing - 850°C, 30 min profile

*Cadmium 'free' as used herein means that this is not intentionally added to the referenced product. Trace amount however may be present.

Product information

Solvent or thinner	Micromax™ 8250
Blend member or series	4300srs

Rheological properties

Viscosity	120 - 200 ^[1] Pa.s
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[1]: Brookfield HAT, UC&SP, SC4-14/6R, 10 rpm, 25°C ± 0.2°C

Application technique

Mask mesh	325
Mask emulsion	10 - 16 μm
Drying time	10 - 15 min
Drying temperature	150 °C
Theoretical coverage	95 ^[2] cm ² /g
Recommended film thickness, dried	23 - 27 μm
Leveling time	10 - 15 min

[2]: based on average fired thickness of 10μm for pads

Electrical properties

Surface resistivity	3000 - 12000 ^[3] mOhm per square
Hot Temperature Coefficient Resistance	-200 - 200 ^[4] ppm/K
Cold Temperature Coefficient Resistance	-200 - 200 ^[5] ppm/K
Short Term Overload Voltage	≥11 V/mm

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Standard Working Voltage	4.4 ^[7] V/mm
Maximum Rated Power Dissipation	1574 ^[8] m/(W.mm ²)
[3]: 10 x 1.25mm resistor; Micromax™ 7780 termination, tolerance	
[4]: at +25°C to +125°C	
[5]: at -55°C to +25°C	
[6]: short time overload voltage; 5 sec pulse sufficient to cause 0.25% change in resistance	
[7]: standard working voltage : 0.4 x STOL	
[8]: maximum rated power dissipation; SWV^2 / R (ohms)	

Storage and stability

Shelf life	6 ^[9] months
[9]: in unopened containers, from date of shipment, at temperature <25°C	

Additional information

How to use

Processing

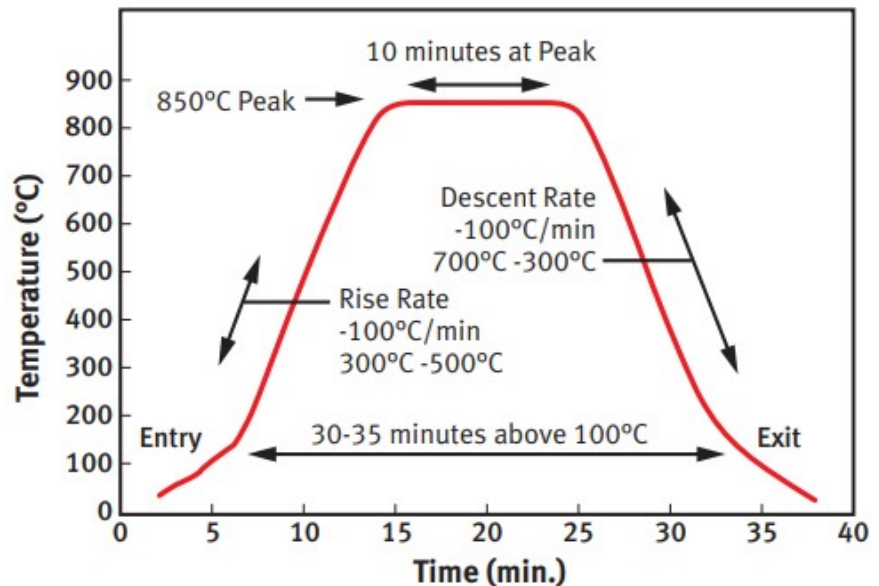
- **Blendability**
 - Adjacent members of Micromax™ 4300-Series are blendable.
- **Substrates**
 - Properties are based on tests using 96% alumina substrates. Substrates of other compositions and from various manufacturers may result in variations in performance properties. Care must be taken to avoid air-bubble entrapment. It is the responsibility of users to determine the effects of the above variables in their particular situations.
- **Printing**
 - Micromax™ 4300-Series Resistor compositions should be thoroughly mixed before use. This is best achieved by slow, gentle hand stirring with a clean, burr-free spatula (flexible plastic) for 0.5-1 minute.
 - Note : Optimum printing characteristics of Micromax™ 4300-Series Resistors are generally achieved in the temperature range 20-23°C. Specified properties are based on resistors printed to 23-27µm dried print thickness. This is generally achieved using a 325-mesh stainless steel screen with a 10-16µm emulsion thickness. Control and reproducibility of print thickness is essential to obtain predictable, reproducible fired resistor properties.
- **Drying**
 - Allow the wet print to level for 10-15 minutes at room temperature in a clean draft free environment, followed by drying for 10-15 minutes at 150°C in a well ventilated oven or conveyor dryer.
- **Firing**
 - It is essential that the air supply to the furnace is clean, dry and

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- free of contaminants. Micromax™ 4300-Series Resistors are fired on a 30-minute firing cycle to a peak of 850 °C held for 10 minutes.
- Variations in peak firing temperature may result in variations in the final fired properties. Resistor compositions must be fired in clean air. Insufficient airflow or pollution of the air in the furnace may result shifts of resistivity and TCR.

FIGURE 1. 30 MINUTES PROFILE



Properties

Typical Fired Properties

Test	Properties
CRV* ¹ (%)	<1.0
Rotational Life* ¹ (200 Cycle)	<1.0

*1 10 finger Paliney wiper; 50 gram force; 10 x 1.25mm resistor

Storage and shelf life

Containers should be stored, tightly sealed, in a clean, stable environment at room temperature (<25 °C). Shelf life of material in unopened containers is six months from date of shipment. Some settling of solids may occur and compositions should

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be thoroughly mixed prior to use.

Safety and handling

For safety and handling information pertaining to this product, read Safety Data Sheet (SDS).

NOTICE TO USERS: Values shown are based on testing of laboratory test specimens and represent data that fall within the standard range of properties for natural material. These values alone do not represent a sufficient basis for any part design and are not intended for use in establishing maximum, minimum, or ranges of values for specification purposes. Colourants or other additives may cause significant variations in data values. Properties of moulded parts can be influenced by a wide variety of factors including, but not limited to, material selection, additives, part design, processing conditions and environmental exposure. Other than those products expressly identified as medical grade (including by MT® product designation or otherwise), Celanese's products are not intended for use in medical or dental implants. Regardless of any such product designation, any determination of the suitability of a particular material and part design for any use contemplated by the users and the manner of such use is the sole responsibility of the users, who must assure themselves that the material as subsequently processed meets the needs of their particular product or use. To the best of our knowledge, the information contained in this publication is accurate; however, we do not assume any liability whatsoever for the accuracy and completeness of such information. The information contained in this publication should not be construed as a promise or guarantee of specific properties of our products. It is the sole responsibility of the users to investigate whether any existing patents are infringed by the use of the materials mentioned in this publication. Moreover, there is a need to reduce human exposure to many materials to the lowest practical limits in view of possible adverse effects. To the extent that any hazards may have been mentioned in this publication, we neither suggest nor guarantee that such hazards are the only ones that exist. We recommend that persons intending to rely on any recommendation or to use any equipment, processing technique or material mentioned in this publication should satisfy themselves that they can meet all applicable safety and health standards. We strongly recommend that users seek and adhere to the manufacturer's current instructions for handling each material they use, and entrust the handling of such material to adequately trained personnel only. Please call the telephone numbers listed for additional technical information. Call Customer Services for the appropriate Materials Safety Data Sheets (MSDS) before attempting to process our products.

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