Celanese
The chemistry inside innovation™

Micromax™ 3515N

Microcircuit and Component Materials

Resistance Element Composition

Micromax™ 35XXN Resistance Element Compositions are designed to be used to form circuitry with controlled resistance that may be used as a heating element. They are intended to be applied over Micromax™ 3500N Insulating Glaze which has been previously applied to the Steel substrate. Micromax™ 35XXN Compositions are applied by screen printing and subsequently fired in a conveyor furnace in an air oxidising atmosphere.

Product characteristics

- Range of TCR values
- Firing using 30 minute profile
- Lead, Cadmium and Nickel free
- No Re-fire resistance shift

*Cadmium, Lead, and Nickel 'free' as used herein means that cadmium, lead, and nickel are not intentional ingredients in and are not intentionally added to the referenced product. Trace amounts however may be present.

Product information

Solvent or thinner	Micromax™ 4553
Blend member or series	35XXNsrs

Rheological properties

Viscosity	80 - 160[1]	Pa.s

[1]: Brookfield HBT, UC&SP, SC4-14/6R, 10 rpm, 25°C±0.2°C

Application technique

Mask mesh	325	
Mask emulsion	8 - 12	µm
Drying time	15	min
Drying temperature	150	°C
Theoretical coverage	130[2]	cm^2/g
Recommended film thickness, dried	15 - 21	µm
Shrinkage, dried	35[3]	%
Shrinkage, fired	45[3]	%
Leveling time	2 - 5	min

[2]: calculated value based on dried thickness of 18µm

[3]: the variability of thickness measurement techniques, particulariy of the wet film, means that the above figures are given for guideline purposes only

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Electrical properties

Surface resistivity	90 - 110[4]	mOhm per square
Hot Temperature Coefficient Resistance	1500[5]	ppm/K

[4]: Resistivity results are nominal values determined on alumina substrates using 325 mesh screen with 10mm emulsion. Values are normalized to 18mm dried print thickness. Experiments indicate that the same values are achieved on steel substrate, on which Micromax™ 3500N Insulating Glaze for steel has been applied and fired.

[5]: TCR determined in the range +25°C to +125°C

Storage and stability

Shelf life	6[6]	months

[6]: in unopened containers, from date of shipment, at temperature <25° C (>0° C)

Additional information

How to use

Design & compatibility

- Compatibility
  - Whilst Micromax™ has tested this composition with the recommended processing conditions, it is impossible or impractical to cover every combination of materials, customer processing conditions and circuit layouts.
  - It is therefore essential that customers thoroughly evaluate the materials in their specific situations in order to completely satisfy themselves with the overall quality and suitability of the compositions for its intended application(s).

Processing

- Substrates
  - Micromax™ 35XXN Resistance element compositions are designed to be used on steel substrates coated with Micromax™ 3500N Glaze for Steel. 430 Grade stainless steel (or equivalent) and a minimum 75µm fired thickness of Micromax™3500N Glaze is recommended. Substrates of different compositions may result in variations in performance. It is the responsibility of the user to determine the suitability of any particular grade of steel for their application.
- Printing
  - Steel substrates coated with Micromax™ 3500N glaze 325 mesh stainless steel screen with a 8-12µm emulsion thickness (To achieve recommended 18 ± 3µm dried thickness). Print speeds of 10 to 20 cm/s may be used.
  - The composition should be thoroughly mixed before use. This is

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best achieved by slow, gently, hand-stirring with a clean burr-free spatula (flexible plastic or stainless steel) for 1-2 minutes. Care must be taken to avoid air entrapment.
    - Printing should be performed in a clean and well-ventilated area.
    - Note : Optimum printing characteristics are generally achieved in the room temperature range of 20°C - 23°C. It is therefore important that the material, in its container, is at this temperature prior to commencement of printing. Control and reproducibility of print thickness is essential to obtain predictable, reproducible fired resistor properties.
- Thinning
    - These compositions are optimized for screen printing. Thinning is not normally required. Use the Micromax™ recommended thinner for slight adjustments to viscosity or to replace evaporation losses. The use of too much thinner or the use of a non-recommended thinner may affect the rheological behavior of the material and its printing characteristics.
- Drying
    - Allow prints to level for 2-5 minutes at room temperature, then dry for 15 minutes at 150°C.
    - Dry in a well-ventilated oven or conveyor dryer.
- Firing
    - 850°C peak held for 10 minutes on 30 minute cycle in an air (oxidising) atmosphere.
    - Fire in a well-ventilated belt, or conveyor furnace. Air flows and extraction rates should be optimized to ensure that oxidizing conditions exist within the muffle, and that no exhaust gases enter the room. It is also essential that the air supply to the furnace is clean, dry, and free of contaminants.
    - Variation in the peak firing temperature and/or the time at the peak temperature may result in variation in the final fired properties.

Properties

- All values reported here are results of experiments in our laboratories intended to illustrate product performance potential with a given experimental design. They are not intended to represent the product's specifications, details of which are available upon demand.

Other system components

- Micromax™ 3500N Insulating Glaze for Steel
- Micromax™ 3500N Glass Encapsulant
- Micromax™ LF131 Silver Termination

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General

Performance will depend to a large degree on care exercised in screen printing. Scrupulous care should be taken to keep the composition, printing screens and other tools free of metal contamination. Dust, lint and other particulate matter may also contribute to poor yields.

Storage and shelf life

Storage : Containers may be stored in a clean, stable environment at room temperature (< 25°C), with their lids tightly sealed. Storage in freezers (temperature < 0°C) is NOT recommended as this could cause irreversible changes in the material.
Shelf life : The composition's shelf life is from date of shipment, for factory-sealed (unopened) containers, stored under room-temperature conditions. Refer to table for shelf life period.

Safety and handling

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

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