DuPont Photopolymer & Electronic Materials

3500N Insulating Glaze for Steel

Preliminary Data Sheet

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.

Product Description

3500N Insulating Glaze for Steel is intended to form an electrically insulating layer on stainless steel sheets, in order to provide a substrate for electrical circuitry. It is applied to the steel by screen printing and is fired in a conveyor furnace in an air oxidising atmosphere.

3500N Glaze is a new dense dielectric based upon a high softening point partially crystalisable glass. This is combined with a unique inorganic filler combination to minimise bowing on 430 grade and similar stainless steels. 3500N Glaze may be used with other system components to build circuits on steel, for example for use as heating elements.

Key features :

- ❑ No pre-oxidation of the steel surface required prior to application
- ❑ Bowing minimised for use on 430 grade stainless steel and derivatives
- ❑ Firing using 30 minute profile
- ❑ Excellent breakdown voltage
- ❑ Lead, Cadmium, and Nickel free

Other System Components

- ❑ 35xx series palladium silver resistive element compositions
- ❑ 36xx series palladium silver resistive element compositions
- ❑ 7760 silver termination

Compatibility

Whilst DuPont has tested this composition with specified materials and under the recommended processing conditions, it is impossible or impractical to cover every combination of materials, customer processing conditions and circuit layout.

It is therefore essential that customers thoroughly evaluate this material in their specific situations, in order to completely satisfy themselves as to the overall quality and suitability of the composition for its intended application(s).

Composition Properties

Viscosity

60-140 Pa.s, Brookfield HBT, Utility cup & spindle (SC4-14/6R), 10rpm, 25°C ±0.2°C.

Thinner

3500N is optimised for screen printing and thinning is not normally required. DuPont Electronics Composition Thinner 9179 may be used sparingly for slight adjustments to viscosity or to replace evaporation losses. However, the use of too much thinner or the use of a non-recommended thinner may affect the rheological behaviour of the material and its printing characteristics.

Coverage

30 cm^2/g based on a fired film thickness of 75µm.

Shrinkage	
Wet to dry	approx 15%
Dry to fired	approx 35%

(The uncertainty in measuring the thickness especially of the wet fill means that these figures are for guidelines only.)

Recommended Processing Procedure

Storage

Containers of 3500N insulating glaze should 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.

Jar rolling is unnecessary and is NOT recommended, as this could change the rheology of the material.

Shelf life

3500N insulating glaze composition has a shelf life of 6 months

from date of shipment, for factory-sealed (unopened) containers, stored under room temperature conditions.

Substrates

Properties are based on work carried out on S430 or S444 grade stainless steels with either a dull polished or on a grit blasted (180/220 alumina) surface. Substrates of different compositions, with different surface finishes or from alternative manufacturers may result in variations in performance. For applications where the substrate is larger than $10cm^2$, the use of steel which is thicker than 1mm is recommended for ease of processing. It is the responsibility of the user to determine the suitability of any particular grade of steel for their application.

Printing

3500N insulating glaze composition should be thoroughly mixed before use. This is best achieved by slow, gentle hand stirring with a clean, burr-free spatula (flexible plastic or stainless steel) for 1-2 minutes. Care must be taken to avoid air-bubble entrapment

Printing should be carried out in a clean, well-ventilated area. Additional information on requirements for printing areas is contained in DuPont Technical Guide, EUT 7.3 "Processing-Screen Printing Rooms", available on request.

The optimum printing characteristics of 3500N are generally achieved in the temperature range 20°C-23°C. It is therefore important that the material, in its container, is at this temperature prior to commencement of printing.

Printing with 145 - 200 mesh stainless steel screens is recommended. The glaze may be applied in 3 - 4 prints, with each layer being sequentially fired to give a minimum of 75µm fired thickness. For further guidance on processing, please refer to "Process Guidelines for Heating Applications on Steel Substrates"

Drying

Allow prints to level at room temperature for 2-5 minutes. Dry for 15 minutes at 150°C in a well ventilated oven, or using a belt drier. The surface should be touch dry.

Firing

Fire in a well ventilated belt or conveyor furnace, in air with a 30 minute cycle to a peak temperature of 850°C for 10 minutes. Care must be taken to ensure that any gases/vapours from other chemicals/materials (e.g. halogenated solvents) do not enter the furnace muffle. It is also essential that the air supply to the furnace is clean, dry and free of contaminants. Air flows and extraction rates should be optimised to ensure that oxidising conditions exist within the muffle, and that no furnace exhaust gases enter the room. Additional information on requirements for firing is contained in DuPont Technical Guide EUT 7.4 "Process Guide-Firing".

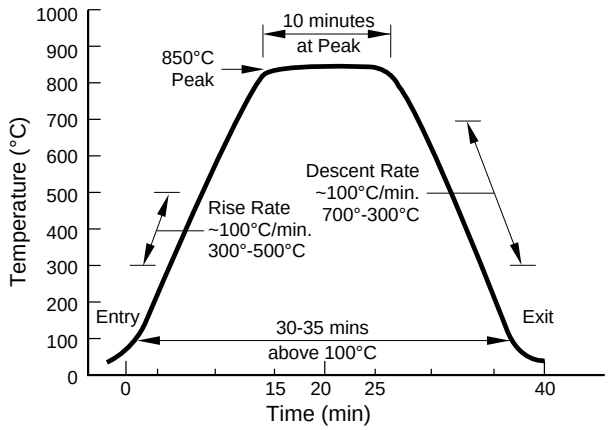
General

Yield and performance will depend to a large degree on the care exercised during processing, particularly in screen printing. Scrupulous care should be taken to keep the 3500N insulating glaze composition, printing screens and other tools free of metal contamination. Dust, lint and other particulate matter may also contribute to poor yields.

Health/Safety considerations

DuPont microcircuit compositions are intended for use in an industrial environment by trained personnel. All appropriate health/safety regulations regarding storage, handling and processing of such materials should be complied with. For information on health/safety regulations, please refer to the specific MSDS for 3500N and to the DuPont Safety Guide EUT 7.1 "Practical Safe Handling of Thick Film Compositions".

Typical 30 Minute Profile



This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own experimentation. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. This information may be subject to revision as new knowledge and experience become available. Since we cannot anticipate all variations in actual end-use conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any patent right. **Caution** : **Do not use in medical applications involving permanent implantation in the human body. For other medical applications, see "DuPont Medical Caution Statement",**

DuPont Electronic Materials in Europe

Sales Offices

Deutschland & Export
Du Pont de Nemours (Deutschland) GmbH
DuPont Electronic Materials
DuPont Straße 1
P.O. Box 1365
D-61343 Bad Homburg
Tel.: (+49-6172) 87-1819
Fax: (+49-6172) 87 1885

France
Du Pont de Nemours (France) S.A.
DuPont Electronic Materials
Z.A. de Courtabœuf - Technopolis
3 Av. du Canada – B.P. 85
F-91943 Courtabœuf Cedex
Tel.: (+33-1) 69 82 54 32
Fax: (+33-1) 69 82 54 98

U.K./Eire/Scandinavia/Benelux
Du Pont (U.K.) Limited
DuPont Electronic Materials
Coldharbour Lane, Frenchay
Bristol,
U.K. BS16 1QD
Tel.: (+44-117) 931 3191
Fax: (+44-117) 931 3131

Technical Centre / *Europe*
Du Pont (U.K.) Ltd.
DuPont Electronic Materials
Coldharbour Lane, Frenchay
Bristol,
U.K. BS16 1QD
Tel.: (+44-117) 931 1444
Fax: (+44-117) 931 3001

España/Portugal
Du Pont Ibérica S.A.
DuPont Electronic Materials
Avda. Diagonal 561,
08029 Barcelona
SPAIN
Tel.: (+34-3) 227 60 00
Fax: (+34-3) 227 62 14

Italia
Du Pont de Nemours (Italiana) S.p.A.
DuPont Electronic Materials
16, Via A. Volta
I-20093 Cologno Monzese
Tel.: (+39-2) 25 30 21
Fax: (+39-2) 254 77 65

All other countries
Du Pont de Nemours International S.A.
DuPont Electronic Materials
P.O. Box 50
2, Chemin du Pavillon
CH-1218 Le Grand-Saconnex
Geneva, Switzerland
Tel.: (+41-22) 717 55 07/55 25
Fax: (+41-22) 717 6280

DuPont Electronic Materials outside Europe

Regional offices

Japan
Du Pont Kabushiki Kaisha
Arco Tower,
8-1, Simomeguro 1-chome
Meguro-ku, Tokyo 153
Japan

Tel : 81-3-5434-6573
Fax : 81-3-5434-6593

Singapore
Du Pont Far East Inc.
DuPont Electronic Materials
1, Maritime Square
07-01 World Trade Centre
Singapore 0409
Republic of Singapore
Tel.: (+65) 272 2244
Fax: (+65) 272 7494

U.S.A.
E.I. du Pont de Nemours & Co
DuPont Electronic Materials
Electronics Technology Center
14 T.W. Alexander Drive
Research Triangle Park
NC 27709
Tel.: (+1-800) 237 43 57
Fax: (+1-302) 992 39 15

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