



QM42 Dielectric

Thick Film Composition 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

QM42 is part of the QM system of materials, a silver based system for low-cost multilayers. It is intended to be applied to ceramic substrates by screen printing and fired in a conveyor furnace in an air (oxidising) atmosphere, to form insulating layers in multilayer interconnect circuits.

QM42 has been designed to give outstanding electrical properties when combined with silver conductors and also enables AgPd, AgPt and Au to be used on top of dielectric for soldered component attachment and wire bonding.

Key Features:

- Compatible with QM Silver based conductors
- Outstanding resistance to E.M.F (mixed metal) blistering and shorting
- Dense, hermetic microstructure
- Robust electrical performance
- Compatible with QM resistor series and optimised for laser trimming

Design notes

The fired thickness of the dielectric layer should be at least 35µm between conducting layers. This can generally be

Composition Properties

Viscosity [Pa.s] Brookfield HBT, Utility cup & spindle (SC4-14/6R), 10 rpm, 25°C ± 0.2°C	200 - 270
Coverage [cm²/g] Based on fired thickness of 17.5µm	110 - 130
Shrinkage [%] Wet to Dry	10 - 20
Dry to Fired	35 - 40
Thinner	9179
Shelf Life [months]	6

Processing Conditions

Printing	Use 200-250 mesh stainless steel screen to print the individual layers. (See design notes)
Drying	Allow prints to level for 5-10 minutes at room temperature, then dry for 10-15 minutes at 150°C
Firing	850°C peak held for 10 minutes on 30 minute cycle in an air atmosphere

Typical Fired Properties¹

Fired Thickness [µm] between conducting layers	35
Via resolution² [µm]	350 - 400
Dielectric Constant [K]	9 - 11
Dissipation factor [%]	< 0.5
Insulation resistance (at 100VDC at 35µm thickness)	>10 ¹¹ Ω
Mean Breakdown voltage (35µm)	>2000 VDC
Mixed Metallurgy blistering³ (number of refires)	>20 at 35µm

- 1 Typical fired properties are based on laboratory tests. Unless expressly noted elsewhere the following conditions have been used
Top and bottom conductor: QM14 Ag conductor
Printing: 200-250 mesh stainless steel screen, 2 layers
Firing: Separate firing using a 30 minute cycle to a peak temperature of 850°C.
- 2 Via size that can be achieved in production will depend on the number of prints, without screen wiping, screen quality and the nature of the underlying circuit etc.
- 3 Configuration: QM31 bottom conductor, QM42 35µm fired thickness, QM21 top conductor separately fired

achieved with 2 prints of the dielectric (If 325 mesh screens are used then 3 prints will be necessary). Use of a double wet pass of the squeegee may help to minimise pinholes when printing the dielectric, although this may be at the expense of via resolution. Each printed dielectric layer should be separately fired. Co-firing is not recommended.

Encapsulation may be necessary, depending on the required circuit environmental performance. It is the circuit manufacturer's responsibility to ensure encapsulation appropriate to the application is used.

For information on designing multilayers please refer to the QM42 Silver Multilayer System Process Guide.

Compatibility

Whilst DuPont 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 material in their specific situations in order to completely satisfy themselves with the overall quality and suitability of the composition for its intended application(s).

Recommended Processing Procedure

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.

For guidance regarding storage of material, please consult DuPont Technical Note EUT 7.2 "Shelf Life Policy".

Shelf life

This 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.

Substrates

Substrates of different compositions and from various manufacturers may result in variations in performance properties.

Thinner

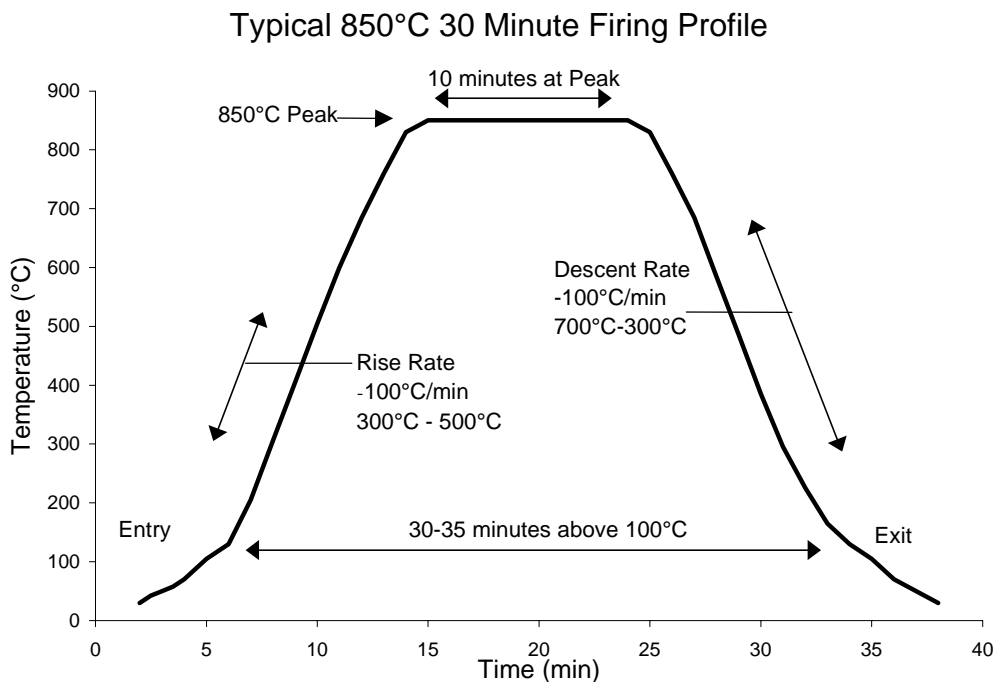
This composition is optimized for screen printing, thinning is not normally required.

Use the DuPont 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 behaviour of the material and its printing characteristics. Refer to table - "Composition Properties"

Printing

The composition should be thoroughly mixed before use. This is 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.



Additional information on requirements for printing areas is contained in DuPont Technical Guide EUT 7.3 "Processing - Screen Printing Rooms", available on request. 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. Class 10,000 printing area is recommended for building complex hybrids and multilayer circuits, otherwise severe yield losses could occur. Refer to table - "Processing Conditions"

Drying

Allow prints to level at room temperature, then dry in a well

ventilated oven or conveyor dryer. Refer to table - "Processing Conditions"

Firing

Fire in a well ventilated belt, 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.

Full information on requirements for firing is contained in DuPont Technical Guide EUT 7.4 "Process Guide - Firing". Refer to table - "Processing Conditions"

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.

Health/Safety considerations

DuPont thick film 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 product MSDS and to the DuPont Safety Guide EUT 7.1 "Practical Safe Handling of Thick Film Compositions".

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" H-50102.**