

Technical Data Sheet

Electronic Glass Materials Pb-Based Sealing Glass Pastes

Application

Ferro's Pb-Based Sealing Glass Pastes are designed for sealing low thermal expansion substrates such as silicon, alumina and soda lime at reduced firing temperature.

DL11-036 and DL11-201 are especially suited for hermetic sealing of wafer-level MEMS packaging, and other micro-mechanical devices such as vibration, YAW and accelerometer sensors.

DL1161HZ is specifically designed for sealing alumina based devices, such as CERDIP package lids, and offers low alpha emission, good chemical resistance and hermeticity.

Excellent quality seals can be achieved at peak firing temperatures as low as 410°C, depending upon the application. The organic vehicle has been specially formulated to ensure complete binder burnout in the range of 280°C to 360°C.

Typical applications for these pastes are:

- **DL1161HZ** alumina packages and glass
Opto-electronic displays
- **DL1180A:** Alumina based devices
- **DL11-036:** Si-to-Si, Si-to-Kovar and Si-to-Alumina devices
- **DL11-155:** Thicker seals in Si-to-metal devices
- **DL11-201:** Si-to metal

These products may be used in RoHS complaint devices as Pb in glass for electronic application is specifically exempted.

Typical Formulation Properties

Storage and Shelf Life: These products should be stored in tightly sealed containers at 10 to 25°C in a dry place away from direct sunlight. The shelf life of a factory sealed container is a minimum of 5 months from date of shipment.

DL11-201 must be stored on a rolling rack at 3 to 4 rpm immediately upon receipt and until completely used to avoid settling.

Typical Process Parameters

Thinning: These pastes are formulated at the appropriate viscosity for the intended application. Contact your Technical Service representative for the correct thinner to use should solvent replacement become necessary.

Printing: Screen print using an 80 to 325 mesh screen, depending on the required film thickness. Typically 0.5 mil emulsion is used for thinner prints and 1 mil for thicker prints.

Leveling: 5 to 7 minutes at room temperature.

Drying: 7 to 12 minutes at 100°C to 120°C in an oven with forced air flow and exhaust. Thick prints with DL11-155 and DL1161HZ may require multiple drying steps.

Binder Burnout and Glazing: Removal of organics and glazing (sintering) of the glass layer is typically carried out in a programmable furnace under an oxidizing atmosphere at the temperatures specified below.

Firing: Following binder burnout and glazing, mate together the materials to be sealed and fire as specified below.

It may be necessary to optimize the firing profiles, depending upon the size and thermal mass of the parts being sealed.

Typical Performance Properties

| Typical Properties | DL1161HZ | DL1180A | DL11-036 | DL11-155 | DL11-201 |
|---|-----------|-------------|-----------|-----------|------------|
| Thermal Expansion (ppm @260°C) | 6.4 | 7.5 | 9 | 9 | 10 |
| Viscosity (Pa.s) | 70 - 90 | 54.5 - 70.5 | 55 - 87.5 | 50 - 100 | 70 - 100 |
| Recommended Screen Mesh | 80 | 250 - 325 | 250 - 325 | 150 - 250 | 250 - 325 |
| Typical Dry Print Thickness (µm) | 34 - 40 | 22 - 28 | 22 - 24 | 20 - 24 | 22 - 28 |
| Typical Fired Print Thickness (µm) | 25 - 30 | 11 - 14 | 7 - 11 | 11 - 14 | 11 - 14 |
| Solids Content (%) | 86 ± 1 | 78 ± 1.5 | 84 ± 2 | 85 ± 2 | 85.5 ± 1.5 |
| Binder Burnout and Glazing Cycle | | | | | |
| Binder Burnout Temperature (°C) | 280 | 400 | 295 | 360 | 315 |
| Time at BBO Temperature (mins) | 30 | 20 - 30 | 20 - 30 | 20 - 30 | 20 - 30 |
| Glaze Temperature (°C) | 380 - 400 | 500 | 400 - 425 | 425 - 450 | 425 - 450 |
| Time at Glaze Temperature (mins) | 5 - 15 | 5 - 15 | 5 - 15 | 5 - 15 | 5 - 15 |
| Firing/Sealing Cycle | | | | | |
| Peak Temperature (°C) | 410 - 430 | 575 - 625 | 425 - 450 | 475 - 550 | 450 - 475 |
| Time at Peak (mins) | 10 - 15 | 10 - 20 | 15 - 30 | 15 - 30 | 15 - 30 |

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