

FK9100M: Pt resistor paste system for Al_2O_3 substrates

The FK9100M platinum resistor paste system was developed for use on alumina substrates. It is deposited on them by screen printing and fired in air in a belt furnace. This allows thick-film heaters and temperature sensors to be produced with a very high temperature coefficient of resistance of equal or over 3000 ppm/K. The material can only be mixed with each other, but not with pastes from other Fraunhofer IKTS FK paste systems.

Processing

Substrates

The paste is specified for use with Rubalit 708S substrates (surface as-fired) from CeramTec. Substrates with a different surface quality or from other manufacturers may lead to deviating results.

Termination

The pastes were developed with a termination of paste C1214 from Heraeus Deutschland GmbH. For screen printing of the heater pastes, the contacts were already fired on the ceramic (post-firing). Other contact pastes can lead to deviating product properties.

Encapsulation

To avoid environmental influences and abrasion, we recommend covering with FK4803 (transparent) or FK4804 (light green) in post-firing.

Screen printing

steel screen with a wire diameter of 40/32 μm and an emulsion thickness of 25 μm (10 to 12 μm EOM) is recommended.

Levelling

The screen printed film should level for 10 ± 2 minutes at room temperature (22 to 25 $^{\circ}\text{C}$).

Drying

The printed films should be dried for 15 minutes at 150 $^{\circ}\text{C}$ in a drying oven with an exhaust air system or in a continuous flow dryer.

Firing

The films should be fired in air at a peak temperature of 850 $^{\circ}\text{C}$, a dwell time of 10 minutes and a total cycle time of 30 minutes in a belt furnace.

Storage

The paste should be stored at 4 to 10 $^{\circ}\text{C}$. This guarantees a high paste viscosity and prevents the solids from settling. The jar must remain tightly closed during storage. To prevent condensation of air humidity on the paste, the jar must not be opened until the contents have reached room temperature. Before using the paste, it must be sufficiently homogenized, for example by stirring it with a spatula.

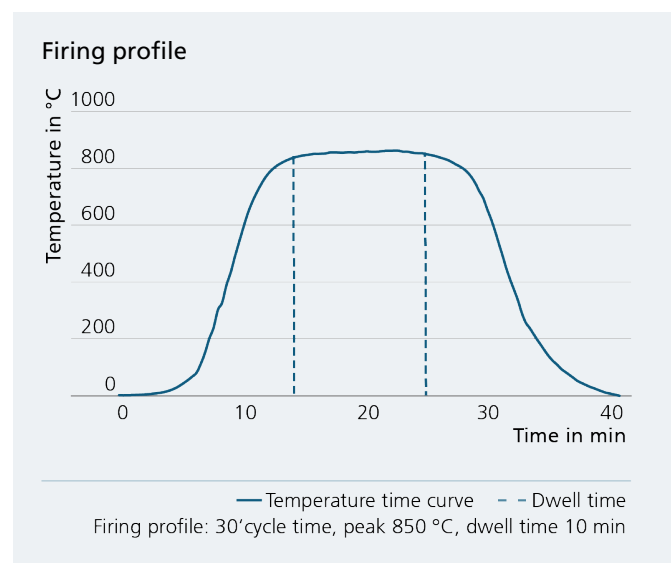
Safety notice

For safe handling of the pastes, please observe the notices in the safety data sheet accompanying each delivery.

Quality requirements

Each delivery will be supplied with Certificate of Analysis (CoA). The paste meets all requirements of RoHS III (regulation 2015/863/EC) and REACH (regulation (EC) 1907/2006).

Instead of an expiration date, after which an expired paste would have to be disposed of regardless of its condition, it is provided with a retest date. The certified values of the paste are valid for six months from the date of shipment of the unopened jars. Prolonged storage may result in segregation of the solids. Then the paste should be mixed thoroughly before further use. After the retest date the customer can decide whether the product needs to be retested to recheck the parameters for further application. The test conditions are given in point 2 to compare the results with CoA.



Technical specifications

Parameter	Unit	FK9112M	FK9115M
Viscosity ¹	Pa·s	TBD	TBD
Sheet resistance ^{2, 3}	mOhm/sq	150	500
Shipping specifications	%	±15	±20
Hot-TCR ^{2, 4}	ppm/K	> 3000	> 3000
Cold-TCR ^{2, 4}	ppm/K	> 3000	> 3000
Wet film thickness	µm	30±5	30±5
Fired film thickness	µm	10±1	10±1
Coverage ⁵	cm ² /g	95±5	95±5

¹ Brookfield viscometer HB with spindle/cup combination SC4-14/-6RP(Y) at n=10 rpm and 25±0.2 °C.

² Firing profile: total cycle time 30 min, 10 min at 850 °C.

³ Resistor geometry 100 mm x 0,5 mm, sheet resistance normalized to a fired film thickness of 12±1 µm.

⁴ Hot-TCR measured between 25 °C and 150 °C, cold-TCR measured between -55 °C and 25 °C.

⁵ Calculated area that can be printed with one gram paste in the recommended thickness.

Miscellaneous

The current technical specifications are published on our website www.ikts.fraunhofer.de.

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