

Thick-film heater elements, Miniature heater elements

High-performance hybrid systems with SMD technology

Hybrid elements offer advantages of small dimensions with high performance. They are suitable as outside-applied container heaters for use in laboratories, industry, smelting bodies, nozzle heaters and various applications in motor vehicles. These elements are vibration resistant and possess very good high-frequency characteristics. SMD technology permits control and regulation devices directly on the heater (max. 130 °C).



Specific surface rating:	15 to 77 W/cm ² depending on paste material
Calibration:	to ± 0.1 % (absolute and relative) with laser
Temperature coefficient:	≤ 30 ppm / K
Temperature increase rate:	up to 100 K/s
Carrier material/thickness:	aluminium oxide Al ₂ O ₃ / 0.25 mm < s < 1.3 mm; stainless steels 1.4016 and 1.4301 with pressed glass insulation 1 mm < s < 3 mm
Dimensions:	2" x 2" (50.8 mm x 50.8 mm), 4" x 4" (101.6 mm x 101,6 mm), other formats possible
Geometric shaping:	laser processing, stamping
Sensor technology:	preferably PTC-Pt, Ni, NTC (also pressed on)
Over-temperature protection:	direct contact bi-metal monitors up to max. 200°C, optionally with tracer heater circuit for implementation of a limiter function, smelting safety (temperature dependent) Ø 4 mm
Heat conductor:	for Al ₂ O ₃ , preferably glued (max. 230 °C continuous temperature) in combination with aluminium sheet metal for heat distribution. Surface contact and direct contact with the medium for small surface loads; steel in direct contact with medium
Heat conductance:	25 W/mK
Breakdown strength:	8.3 KV/mm (210 V / mil)
Dielectric loss factor δ:	2·10 ⁻⁴ at 1 MHz
Chemical resistance:	see stainless steels and technical ceramics. Conductive and resistance pastes are dishwasher safe; when coated with polymers or special glass, also conditionally acid resistant.
Regulation:	by SMD technology; PD temperature regulator can be realised directly on the heater plate
Current rating:	1 A per mm width (depending on design, up to 3 A/mm possible)
Voltage rating:	100 V max (at 0.4 mm spacing)
Resistors:	resistor range 10-3-109 Ω
RoHs compatibility:	yes