

3M™ Silicon Nitride Thermocouple Protection Tubes

The most efficient material used for temperature measurement and control of aluminium and many non-ferrous alloys.



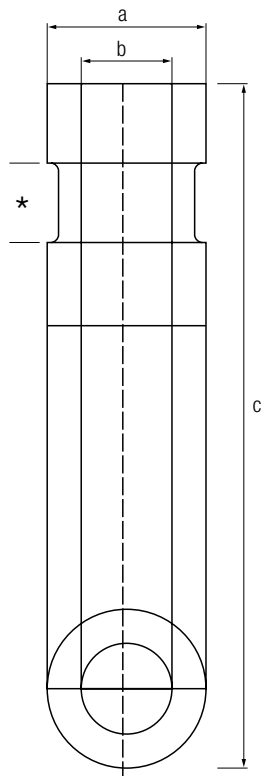
3M™ Silicon Nitride Thermocouple Protection Tubes in different designs

Advantages

- Gas-tight
- Long life typically > 12 months
- Excellent temperature response – melt temperature can be determined after approx. 1 min.
- Unaffected by corrosion throughout its lifetime
- Can be used in melts containing sodium and strontium
- No melt contamination
- High temperature resistance up to approx. 1,300 °C
- High thermal shock resistance
- No preheating required at operation temperature below 900 °C
- Resists build up of dross
- Electrically insulating
- High abrasion and erosion resistance
- Easy cleaning of bake-on
- Best price performance ratio

Comparison of properties of common materials used in molten aluminium

| | Chemical resistance | Mechanical resistance | Response time | Life time | Price / performance ratio | Overall estimation |
|---------------------|---------------------|-----------------------|---------------|-----------|---------------------------|--------------------|
| 3M™ Silicon Nitride | +++ | 0 | ++ | +++ | ++ | ++ |
| Silicon carbide | 0 | - | 0 | - | - | -/0 |
| Clay graphite | 0 | -- | -- | -- | -- | --/- |
| Cast iron | --- | +++ | ++ | --- | --- | - |



* supplied with or without groove

Specification

Typical Material Properties

| | | |
|----------------------------------|-----------------------|---|
| Phase composition | | β - Si_3N_4 , Oxide |
| Density | g/cm ³ | > 3.24 |
| Porosity open | vol % | 0 |
| Porosity total | vol % | < 0.5 |
| Flexural strength, 4-pt bending | MPa | 700 |
| Compressive strength | MPa | > 2,500 |
| Vickers-hardness HV1 | GPa | 15 |
| Young's modulus | GPa | 300 |
| Coefficient of thermal expansion | [10 ⁻⁶ /K] | |
| 25 °C – 500 °C | | 2.5 |
| 500 °C – 1,000 °C | | 3.9 |
| Thermal conductivity at 25 °C | [W/m K] | 27 |

Standard sizes

| Outside diameter (mm) a | Inside diameter (mm) b | max. length (mm) c |
|-------------------------|------------------------|--------------------|
| 16 | 8 | 550 |
| 22 | 12 | 1,050 |
| 28 | 16 | 1,200 |

With circumferential flat bottomed or hemispherical groove on request.
Other sizes and groove designs available on request.

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