

3M Advanced Materials Division

# 3M™ Silicon Carbide Thermocouple Protection Tubes

## Introduction

Thermocouple protection tubes made of 3M™ Silicon Carbide Grade F (SSiC) show an excellent performance under corrosive and abrasive conditions and very high temperatures. 3M silicon carbide thermocouple protection tubes provide both absolute gas impermeability and high purity of >99% SiC at the same time.



3M™ Silicon Carbide Thermocouple Protection Tubes for extreme environments

## Standard Sizes

Outside diameter, a (mm)	Inside diameter, b (mm)	Length, c* (mm)
16	8	550
22	12	1050
28	16	1200

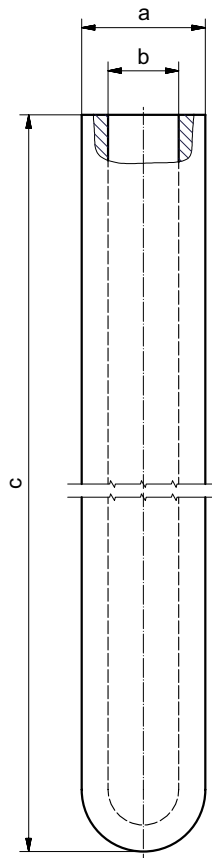
\*Up to listed value

## Advantages

- Extreme temperature resistance up to 1,600°C in oxidizing atmospheres and 2,000°C under protective gas/vacuum
- Excellent oxidation resistance
- Fast response due to high thermal conductivity
- Good thermal shock behavior
- No gas permeability
- Pure  $\alpha$ -SiC matrix
- Excellent corrosion resistance against aggressive media
- High abrasion and erosion resistance

## Applications

- Furnaces and combustion chambers under harsh conditions (corrosive and abrasive media, high gas velocities)
- Desulfurization units



## Typical Material Properties

(Not for specification purposes)

Property	Unit	3M™ Silicon Carbide Thermocouple Protection Tubes
Phase Composition		$\alpha$ -SiC
Density	g/cm <sup>3</sup>	>3.10
Porosity Open	vol %	0
Porosity Total	vol %	<3
Flexural Strength, 4-pt Bending	MPa	400
Compressive Strength	MPa	>2,500
Vickers-hardness HV1	GPa	24.5
Young's Modules	GPa	430
Coefficient of Thermal Expansion		
25 – 500 °C	10 <sup>-6</sup> /K	3.8
500 – 1,000 °C	10 <sup>-6</sup> /K	5.1
Thermal Conductivity at 25°C	W/m K	130

**Warranty, Limited Remedy, and Disclaimer:** Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. User is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application. User is solely responsible for evaluating third party intellectual property rights and for ensuring that user's use of 3M product does not violate any third party intellectual property rights. Unless a different warranty is specifically stated in the applicable product literature or packaging insert, 3M warrants that each 3M product meets the applicable 3M product specification at the time 3M ships the product. 3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY OF NON-INFRINGEMENT OR ANY IMPLIED WARRANTY OR CONDITION ARISING OUT OF A COURSE OF DEALING, CUSTOM OR USAGE OF TRADE. If the 3M product does not conform to this warranty, then the sole and exclusive remedy is, at 3M's option, replacement of the 3M product or refund of the purchase price.

**Limitation of Liability:** Except where prohibited by law, 3M will not be liable for any loss or damages arising from the 3M product, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted, including warranty, contract, negligence or strict liability.

**Technical Information:** Technical information, recommendations, and other statements contained in this document or provided by 3M personnel are based on tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed. Such information is intended for persons with knowledge and technical skills sufficient to assess and apply their own informed judgment to the information. No license under any 3M or third party intellectual property rights is granted or implied with this information.



### 3M Technical Ceramics

Zweigniederlassung der 3M Deutschland GmbH  
Max-Schaidhauf-Str. 25, 87437 Kempten,  
Germany

Phone +49 (0)831 5618-0  
Web [www.3M.de/Technical-Ceramics](http://www.3M.de/Technical-Ceramics)

### 3M Advanced Materials Division

3M Center  
St. Paul, MN 55144 USA

Phone 1-800-367-8905  
Web [www.3M.com/advancedceramics](http://www.3M.com/advancedceramics)

The management system has been certified according to DIN EN ISO 9001, DIN EN ISO 50001, DIN EN ISO 14001.

3M is a trademark of 3M Company. Used under license by 3M subsidiaries and affiliates.

Please recycle. Printed in USA © 3M 2017. All rights reserved. Issued: 05/17 12670HB 98-0050-0327-6