SELECTION GUIDE 14 min read Updated January 2024

Ceramic Fiber Temperature Grade Selection: 1260°C vs 1350°C vs 1430°C

Understanding classification temperature, continuous use limits, shrinkage behavior, and density selection for alumina-silica ceramic fiber blankets per ASTM C892.

Ceramic fiber blanket temperature grade selection requires understanding the critical distinction betweer use temperature (the actual maximum service temperature for sustained operation, typically 150–250°C l without catastrophic melting or structural collapse, measured under standardized test conditions. Contin annually, beyond which excessive linear shrinkage (>3–5%) occurs, creating insulation gaps, hot spots, a 1200°C — within the classification rating but far exceeding the ~1050°C continuous use limit — resulting i

Proper fiber grade selection follows a three-step process: (1) determine actual continuous operating temp temp + 200–250°C safety margin, and (3) select appropriate density (96, 128, 160, or 256 kg/m³) based data, continuous use temperature limits, cost-performance trade-offs, and application-specific recomme

Classification Temperature vs Continuous Use Temperature

> **Critical Concept:** Classification temperature is NOT the operating temperature limit. It is a material property

FIBER GRADE	CLASSIFICATION TEMP (°C)	CONTINUOUS US
Standard Grade	1260	1000–1050
High-Purity Grade	1350	1150–1200
High-Alumina Grade	1430	1300–1350

Why the Temperature Gap Exists

The 150–250°C difference between classification and continuous use temperatures results from three de

- **Devitrification (crystallization):** Amorphous alumina-silica fibers transform to crystalline phases (mull
- **Grain growth:** Crystallite size increases over time at temperature, reducing surface area and increasin
- **Volatilization:** Minor constituents and binders gradually volatilize, reducing fiber cohesion and increas

These mechanisms are **time-dependent** — 24 hours at 1260°C causes minimal damage to 1260°C fiber, l

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Linear Shrinkage Behavior by Temperature & Time

Linear shrinkage is the primary failure mode for ceramic fiber insulation. Industry accepts ≤3% shrinkage

SERVICE TEMP	24 HOURS	500 HOURS	2000 H
900°C	0.5%	0.8%	1.2%
1000°C	1.0%	1.8%	2.5%
1100°C	1.8%	3.2%	5.5%
1200°C	3.5%	6.5%	10.5%

SERVICE TEMP	24 HOURS	500 HOURS	2000 HOUR
1000°C	0.3%	0.5%	0.8%

SERVICE TEMP	24 HOURS	500 HOURS	2000 HOUR
1100°C	0.8%	1.2%	1.8%
1200°C	1.5%	2.3%	3.2%
1300°C	3.0%	5.0%	7.5%

SERVICE TEMP	24 HOURS	500 HOURS	200
1100°C	0.2%	0.4%	0.6
1200°C	0.6%	0.9%	1.3
1300°C	1.2%	1.9%	2.8
1400°C	2.8%	4.5%	6.5

Shrinkage Decision Rule

For applications operating >1000 hours/year, target **<2.5% shrinkage at 2000-hour exposure**. This service × 2000 hours/year → 1350°C fiber (continuous use ~1200°C) is minimum; 1430°C fiber prov

Grade Selection Decision Matrix

STEP 1

Measure Continuous Operating Temperature

Do not use design temperature or peak excursion temperature. Measure actual steady-state hot-face tem

— **IR pyrometer:** Spot measurement during normal operation (account for emissivity; ceramic fiber ε ≈ 0.

— **Thermocouples:** Embed Type K (up to 1200°C) or Type S (up to 1500°C) at fiber hot face

— **Thermal imaging:** Full-surface temperature map to identify hot spots (often 50–100°C above average

> **Warning:** Design temperature is often 50–150°C lower than actual operating temperature due to process va

STEP 2

Match Continuous Use Temperature to Service Requirement

CONTINUOUS SERVICE TEMP	MINIMUM FIBER GRADE	RECOMME
<900°C	1260°C	1260°C
900–1000°C	1260°C	1260°C
1000–1100°C	1260°C (marginal)	1350°C
1100–1200°C	1350°C	1350°C or
1200–1300°C	1430°C	1430°C
>1300°C	Not suitable	Use IFB or

STEP 3

Select Appropriate Density (96 / 128 / 160 / 256 kg/m³)

Ceramic fiber blankets are available in four standard densities. Higher density provides better durability a

DENSITY (KG/M³)	THERMAL CONDUCTIVITY @ 600°C (W/M·K)	HANDLING / DUR
96	0.14–0.16	Fragile; careful ha
128	0.16–0.18	Good; standard in
160	0.18–0.20	Excellent; resists
256	0.22–0.25	Superior; erosion

Selection Rule: Use 128 kg/m³ as default for backup insulation. Upgrade to 160 or 256 kg/m³ only when g benign environments.

Cost-Performance Trade-Off Analysis

Material cost increases significantly with higher temperature grades. However, total cost of ownership mu

FIBER GRADE	RELATIVE COST PER M²	RELATI
1260°C	1.0× (baseline)	1.0× (ba
1350°C	1.35×	1.35×
1430°C	1.60×	1.60×

Service Life vs Material Cost Example

Application: Industrial furnace, 1150°C continuous operation, 100 m² fiber lining, 50mm thickness.

Scenario A: 1260°C Fiber (Under-Specified)

- Material cost: $4,500 (100 m² × $45/m²)
- Expected service life: 12–18 months (excessive shrinkage)
- Replacement frequency: Every 1.5 years
- 10-year total cost: $4,500 × 6.7 replacements = **$30,150**

Scenario B: 1350°C Fiber (Correctly Specified)

- Material cost: $6,075 (100 m² × $60.75/m²)
- Expected service life: 4–6 years (minimal shrinkage)
- Replacement frequency: Every 5 years
- 10-year total cost: $6,075 × 2 replacements = **$12,150**

Scenario C: 1430°C Fiber (Over-Specified)

- Material cost: $7,200 (100 m² × $72/m²)
- Expected service life: 6–8 years (excellent stability)
- Replacement frequency: Every 7 years
- 10-year total cost: $7,200 × 1.43 replacements = **$10,296**

Total Cost Verdict

For this 1150°C application, **1350°C fiber delivers optimal TCO** — 60% lower 10-year cost than und
extended service life, justified for critical applications where replacement downtime is expensive. **Un**

Common Specification Errors & Consequences

ERROR 01

Using Classification Temperature as Operating Temperature Limit

Mistake: Specifying 1260°C fiber for 1200°C service temperature because "it's rated for 1260°C." **Re**
damage adjacent equipment. **Correct approach:** Use 1350°C or 1430°C fiber (continuous use ~1200

ERROR 02

Relying on Design Temperature Instead of Measured Temperature

Mistake: Furnace designed for 1050°C, specified with 1260°C fiber. Actual operating temperature m
Always verify actual operating temperature with pyrometer before specifying fiber grade.

ERROR 03

Ignoring Shot Content Specification

Mistake: Accepting fiber blanket with 22% shot content (non-fibrous particles) to save 10% on mate during installation and service, contaminating workspace and product. **Standard:** Specify <12% shot

ERROR 04

Mixing Fiber Grades in Layered Installations

Mistake: Installing 1260°C fiber as hot-face layer (in contact with 1150°C surface) backed by 1350°C creating delamination and air gaps. **Correct approach:** Use same grade throughout, or place higher-

Fiber Grade Specification Checklist

01 **Measure actual continuous operating temperature** — Use IR pyrometer or embedded thermocouples; d

02 **Identify hot spots and peak temperatures** — Thermal imaging survey to find areas 50–100°C above aver

03 **Calculate required continuous use temp** — Service temp + 100–150°C safety margin = minimum continu

04 **Match to fiber classification temperature** — Use grade where classification temp ≥ continuous use requi

05 **Select appropriate density** — 128 kg/m³ default; upgrade to 160 or 256 kg/m³ for gas velocity >5 m/s or a

06 **Specify shot content limit** — <12% for premium applications, <18% maximum for standard use (per ASTM

07 **Request shrinkage test data** — Supplier should provide linear shrinkage at service temperature × 24h pe

08 **Calculate total cost of ownership** — Material cost ÷ expected service life (years) = annualized cost; comp

Vuulcan Ceramic Fiber Blanket: Available in 1260°C, 1350°C, and 1430°C grades, densities from 96 to
shrinkage test da

View Techn

Content produced from Zibo's ceramic fiber manufacturing zone — one of China's primary production reg insulation markets worldwide.

IN THIS ARTICLE

FREQUENTLY ASKED QUESTIONS

Ceramic Fiber Temperature Grade FAQ

What's the difference between classification temperature and continuous use temperature for ceramic fiber? +

Can I use 1260°C fiber at 1200°C service temperature? +

How do I know when to upgrade from 1260°C to 1350°C or 1430°C fiber? +

Does higher temperature grade fiber cost significantly more? +

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