Mantec
Refractories

Innovative Manufacturing Technologies
for Global Heavy Clay Markets

www.mantecrefractories.com

Mantec Refractories

Mantec Refractories is a division of Mantec Technical Ceramics, a diverse manufacturing technology company, with an historical pedigree spanning more than 50 years, providing bespoke and innovative refractory products and manufacturing solutions to global heavy clay companies.

Mantec has its headquarters in Stoke-on-Trent, the heart of the UK ceramics region. This area is world-famous for its ceramic expertise and heritage, which enables Mantec to employ the very best in technical know-how. Mantec constantly strives to remain industry specialists in all its fields of expertise and is able to export its ceramic-based solutions around the world.

The following innovative and world class products are indispensable to heavy clay manufacturers in maximising the thermal performance and efficiencies within their kilns:

Ultralite™
Advanced Solutions

A complete range of innovative, energy efficient and ultra-lightweight refractory products, which in an era of ever-increasing fuel costs, is making a huge impact within many heavy clay plants around the world by making a significant contribution towards reducing overall kiln energy consumption costs and thus improving manufacturing efficiencies and profits.

BULLERS™
Pyrometric Rings

Mantec is the home of the globally renowned and industry standard Bullers Temperature Control Devices utilised by many of the world's leading heavy clay manufacturers as an essential low cost and accurate tool to reliably check and monitor the balance and consistency of the firing conditions inside their kilns.

Ultralite™
Advanced Solutions

Ultralite Technology

Ultralite is an extremely ultra-lightweight, microporous refractory material uniquely available from Mantec Technical Ceramics.

The patent pending Ultralite technology is designed to be the modern substitute for more traditional and less efficient materials such as vermiculite, perlite, expanded clay, ceramic fibre and other denser refractory castables.

By specifying and installing Ultralite technology inside their kilns, heavy clay manufacturers therefore ensure that they are adopting the latest efficient material technologies that offer long term consistent product performance as well as long term cost & energy savings.

Ultralite refractory products have the following superior technological and performance advantages over other refractory materials:

- Stability at elevated temperatures
- High open porosity
- Low thermal mass
- Low permeability
- Low thermal conductivity
- Low bulk density
- Ultra-lightweight

Ultralite Refractory Products

The Ultralite refractory range consists of the following market-leading products particularly developed for the global heavy clay sector:

- **Ultralite Loose Fill (ULF)**
  High temperature refractory insulation

- **Ultralite Refractory Castables (URC/UCF)**
  Ultra-lightweight monolithic refractories

The combined use of these Ultralite refractories inside a kiln ensures optimum kiln design and performance.

Ultralite™
Advanced Solutions

Ultralite Loose Fill (ULF)

The ultimate kiln car loose fill insulator with **exceptional long-lasting insulating properties**.

Product Code	Classification Temperature	Density	Typical Industrial Sector
ULF-10	1050°C (1922°F)	75Kg/m³ (4.68 lb/ft³)	Brick, Roof Tile, Sanitaryware
ULF-12	1250°C (2282°F)	110Kg/m³ (6.87 lb/ft³)	Sanitaryware, Tableware, Refractories

The Benefits of Ultralite Loose Fill:

- Highly efficient and lightweight, resulting in energy savings **up to 40%** in kiln car bases on every firing.
- Low density, low thermal mass and high porosity, resulting in lower kiln energy costs which reduces carbon footprint.
- Free flowing & ease of handling – very easy to install. It pours very conveniently into awkward spaces and reduces construction time (no physical packing required).
- No refractory ceramic fibre (RCF), therefore not classified as hazardous waste.
- Stable at high temperatures - does not degrade in use, therefore can be re-used time and again.
- Superior alternative to conventional kiln car insulation materials.
- Can be re-used time and again after kiln car repairs and maintenance.

Ultralite Refractory Castables

Mantec manufactures its Ultralite Refractory Castables by blending its highly successful Ultralite Loose Fill (ULF) insulation material with high grade refractory aggregates and cements, which results in a range of ultra-lightweight monolithic refractories with exceptional heat insulating properties and very low densities suitable for use within all types of kilns & furnaces.

These flexible products can be used in a variety of applications, such as a hot face or back-up refractory kiln lining, in the sub-floor of a kiln or kiln car base and the creation of monolithic cast shapes.

The three main available products have maximum service temperatures ranging from 950°C (1742°F) up to 1200°C (2192°F) and densities from 325kg/m³ (20.28lb/ft³) to 645kg/m³ (40.27lb/ft³):

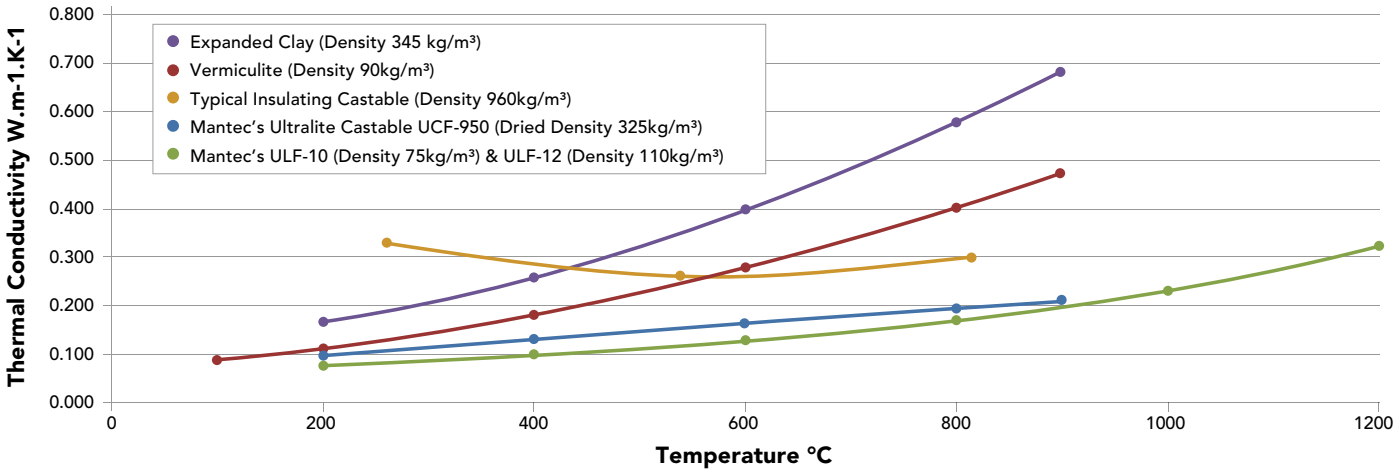
Product Code	Maximum Service Temperature	Density (Dried & Cured at 105°C)	Typical Applications
UCF-950	950°C (1742°F)	325kg/m³ (20.28lb/ft³)	Back-up insulation, sealing kiln car bases, securing support posts, lining kiln roofs
URC-11	1100°C (2012°F)	580kg/m³ (36.21lb/ft³)	Hot face kiln linings, monolithic cast shapes
URC-12	1200°C (2192°F)	645kg/m³ (40.27lb/ft³)	Hot face kiln linings, monolithic cast shapes

Ultralite Versus Conventional Insulation Materials

Ultralite refractory products are designed to be modern replacements for more traditional insulation materials within heavy clay kilns so they offer real alternative choices for the discerning heavy clay manufacturer.

The low thermal mass of Ultralite refractory products, coupled with their superior lower thermal conductivity values, allow energy savings on every kiln car fired.

The graphs below show a comparison of material densities & thermal conductivities, in which Ultralite products can be seen with the lowest values compared to competitors, particularly at elevated temperatures (above 1000°C /1832°F).



Ultralite Technical Data

Main Properties		Units	ULF-10	ULF-12	UCF-950	URC-11	URC-12
Product Type			Ultralite Loose Fill	Ultralite Loose Fill	Ultralite Cavity Fill Castable	Ultralite Refractory Castable	Ultralite Refractory Castable
Application			High Temperature Insulation	High Temperature Insulation	Insulating Castable / Monolithic Refractory	Insulating Castable / Monolithic Refractory	Insulating Castable / Monolithic Refractory
Recommended Maximum Service Temperature		°C (°F)	1050 (1922)	1250 (2282)	950 (1742)	1100 (2012)	1200 (2192)
Powder Loose Bulk Density (Subject to settling in transit)		Kg/m³ (lb/ft³)	75 (4.68)	110 (6.87)	Approx. 220 - 240 (13.73 – 14.98)	Approx. 420 - 460 (26.21– 28.72)	Approx. 420 - 460 (26.21– 28.72)
Bulk Density (Dried & Cured at 105°C)		Kg/m³ (lb/ft³)	-	-	Approx. 300 - 350 (18.72 – 21.84)	Approx. 540 - 620 (33.71– 38.71)	Approx. 620 - 670 (38.71– 41.83)
Bulk Density (Fired)		Kg/m³ (lb/ft³)	-	-	Approx. 280 - 340 (17.47 - 21.22) Fired at 950°C	Approx. 590 (36.83) Fired at 1100°C	Approx. 620 (38.71) Fired at 1200°C
Approx. Net Material Required to make 1m³ of Castable		m³ (Kgs)	-	-	1.3m³ (286 - 312Kgs)	1.3m³ (546 - 598Kgs)	1.3m³ (546—598Kgs)
Modulus of Rupture (ASTM C133-97 & C865. Dried & Cured at 105°C)		MPa (psi)	-	-	-	0.73 (106)	1.36 (197)
Cold Crushing Strength (ASTM C133-97 & C865. Dried & Cured at 105°C)		MPa (psi)	-	-	0.6 (87)	1.50 (218)	2.91 (422)
Thermal Conductivity (ASTM C201/182) N.B. All temperatures are **MEAN** temperatures	200°C (392°F)	W/m K (BTU in/hr ft² °F)	0.08 (0.55)	0.08 (0.55)	0.14 (0.97)	0.13 (0.90)	0.22 (1.53)
	400°C (752°F)	W/m K (BTU in/hr ft² °F)	0.10 (0.69)	0.10 (0.69)	0.17 (1.18)	0.16 (1.11)	0.24 (1.67)
	800°C (1472°F)	W/m K (BTU in/hr ft² °F)	0.17 (1.18)	0.17 (1.18)	0.19 (1.32)	0.22 (1.53)	0.20 (1.39)
	1000°C (1472°F)	W/m K (BTU in/hr ft² °F)	0.23 (1.59)	0.23 (1.59)	-	-	-
Chemical Composition	Al_2O_3	%	31.34	31.34	34.44	38.75	39.56
	SiO_2	%	53.47	53.47	36.53	27.77	29.33
	Fe_2O_3	%	0.84	0.84	5.74	9.23	8.71
	TiO_2	%	1.21	1.21	1.48	-	-
	CaO	%	0.36	0.36	13.38	19.54	18.48
	MgO	%	0.56	0.56	0.37	-	-
	Na_2O	%	0.36	0.36	0.25	0.40	0.28
	K_2O	%	2.19	2.19	1.46	1.05	0.79
	Alkalis	%	< 3.5	< 3.5	< 2.5	< 2.0	< 1.5
Approx. Mixing Ratio (By Volume in Litres)		Ltr. Water : Ltr. UCF/URC	-	-	32 : 100	40 : 100	34 : 100
Approx. Mixing Ratio (By Weight in Kgs.)		Kgs Water : Kgs UCF/URC	-	-	140 : 100	90 : 100	77 : 100
Standard Packaging			1m³ Bulk Bags	1m³ Bulk Bags	20 litre sacks	20 litre sacks	20 litre sacks

Note: The information and technical data contained herein are correct at the date of issue and represent typical values obtained in accordance with normal manufacturing tolerances. Mantec Technical Ceramics reserves the right however to change this information and technical data at any time without notice. Contact Mantec Technical Ceramics for the most current information.

BULLERS™ Pyrometric Rings

Scan this QR Code to download the following additional information and technical assistance from Mantec's website:

- Frequently Asked Questions
- Temperature Correlation Charts
- Bullers Ring Gauge User Guides (TR100, TR200 & TR300)

What are Bullers Rings?

Mantec, with its HQ in Stoke-on-Trent in the heart of the UK ceramics region, is the home of the globally renowned and industry standard Bullers Temperature Control Devices. Bullers Rings are essential for reliable monitoring of 'heat work' or 'heat energy' in a kiln or furnace. Heat work is the effect of temperature over time or how well 'cooked' or 'processed' ceramic products are.

Bullers Rings operate within a full range of firing temperatures from 750°C to 1420°C (1382°F to 2588°F).

Temperature Range	Product Code
Very Low Temperature 750°C - 1000°C (1382°F - 1832°F)	TR89/05
Low Temperature 960°C - 1100°C (1760°F - 2012°F)	TR55/84
Standard Temperature 960°C - 1250°C (1760°F - 2282°F)	TR27/84
Extended Temperature 960°C - 1320°C (1760°F - 2408°F)	TR75/84
High Temperature 1280°C - 1420°C (2336°F - 2588°F)	TR73/84

The most common applications for Bullers Rings are in the firing of:

- Heavy Clay
- Sanitaryware
- Tableware
- Wall/Floor Tiles
- Refractories

The Benefits of Bullers Rings:

- Bullers Rings are an essential part of any Quality Assurance System to ensure the accurate firing of ceramic products.
- Bullers Rings experience the same 'thermal journey' as your ceramic ware so are an early indicator of 'under fired' product that enables preventative action to be taken to ensure the correct product quality.
- Bullers Rings are sensitive to changes in 'Heat Work or Heat Energy' and their contraction will depend on the combination of temperature, rate of firing and length of soaking time. Thermocouples alone cannot and will not provide you with this vital information!
- Bullers Rings offer a rapid, low-cost, consistent and reliable method of accurately monitoring kiln performance and aid in establishing optimum firing regimes that: **Maximise Yields, Increase Productivity, Decrease Waste & Improve Profitability.**

Place • Measure • Improve

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