BULLERS™
Pyrometric Rings

Mantec
Technical Ceramics

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Mantec Technical Ceramics Ltd has been making the globally renowned *Bullers Rings* in the UK for over 80 years.

***Bullers Rings* are utilised by many of the world's leading ceramic manufacturers to measure the amount of *Heat Work* that has taken place in the kiln, giving an independent, accurate and reliable indication that the firing of the product is correct and unaffacted by any variations in temperature and kiln loading.**

World Class Manufacturing Techniques

To ensure consistency and accuracy, *Bullers Rings* are manufactured to a precise materials specification under strict quality parameters.

Each batch of spray dried materials is pre-tested to our exacting standards before being released for manufacture. This consistency ensures a reliable and reproducible quality time after time.

Worldwide Applications

Bullers Rings are used in over 45 countries worldwide by the global leading producers of ceramic products.

Applications range from earthenware, sanitaryware, tableware, bricks, tiles, bone china, refractories, hard porcelain are used within the high temperature world of technical ceramics. Our customers' applications are served by a wide range and grade of rings which enable a temperature range of 750°C - 1420°C to be monitored.

The use of just a few *Bullers Rings* enables craft studios and other users of small kilns to ensure the same accuracy of kiln environment as enjoyed by major ceramic producers. *Bullers Rings* are used in all types of kiln, continuous or intermittent, providing an independent indicator of firing consistency.

Maximising Yields and Profit

Maximum yields and profits come from consistent and reliable production.

Even with the most sophisticated of kiln control systems, there is no substitute for monitoring and controlling *Heat Work* with *Bullers Rings*. It is critical to ensure a controlled and uniform application.

Small changes in *Heat Energy* absorption could have a dramatic effect on the fired component performance, by monitoring Heat Work at the point of product placement you will ensure an even firing characteristic resulting in higher yields and greater profitability.

Consistent use of Bullers Rings ensures profitable firings time after time!

What is *Heat Work* and why should you measure it?

Heat Work is the action and effect of temperature over time on a ceramic product, often referred to as *Heat Energy*. Simply put, it is a defined measurement of how a product has been cooked or processed while in production.

Bullers Rings allow you to understand the effect that temperature has on the product and what action is required to prevent costly production problems occuring on future firings.

You can use *Bullers Rings* to increase your yields. Early notifications of under fired products allow you to re-fire to the correct quality, saving scrap products while maintaining capacity and profitability.

Only *Heat Work* measuring and monitoring will allow you to understand what has happened to the product in the kiln independently of time and temperature.

Maximise Yields • Increase Productivity • Decrease Waste • Improve Profitability

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How to Select Bullers Rings

In order to correctly select Bullers Rings we have provided a selection chart detailing many of the most common firing applications.

The purpose of the chart is to provide a guide from which to choose the most appropriate product. In some instances this may necessitate trials using two closely matching products to ascertain the one that most closely matches your own particular firing conditions.

The selection criteria for *Bullers Rings* within a Sanitaryware facility employing a tunnel kiln would depend on many factors. However, the critical one is the peak firing temperature, which could be around 1250°C for 4 hours the number 75 is selected.

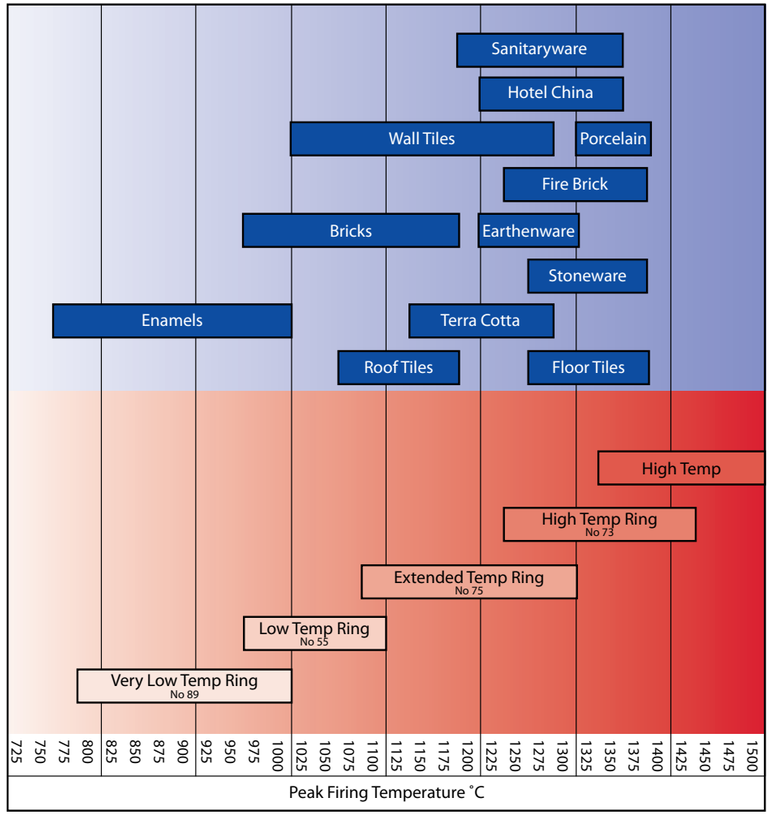
Other factors that play a part in the measurement of *Heat Work* and the selection of the appropriate *Bullers Ring* is the total time the product is within the kiln atmosphere, kiln car loading and hence the kiln car density.

In the chart opposite we have provided three selection criteria to assist with the choice of the correct product.

To effectively use the chart for product selection, select the peak firing temperature (1250°C in this case) and follow that temperature line, select the *Bullers Ring* whose central temperature spread is nearest to the Peak Firing temperature.

By using the chart as a guide, you can select the correct product for your specific firing conditions.

Call our technical team on +44 1782 377550 for help and assistance



The most reliable means of measuring Heat Work in high temperature kilns

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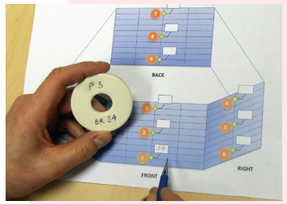
A Step by Step Guide to using *Bullers Rings*

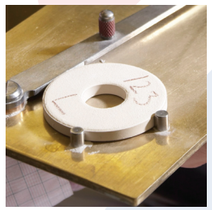
1. Select the appropriate *Bullers Ring* to suit your firing.

Remove the *Bullers Rings* from the box. The batch number is clearly displayed on the outer packaging and this should be recorded for reference.

2. Position the *Bullers Rings* onto the kiln in accordance with a predetermined plan. Mark the position numbers onto the *Bullers Rings* for the purpose of mapping the kiln firing, and detail this onto the kiln record sheet.



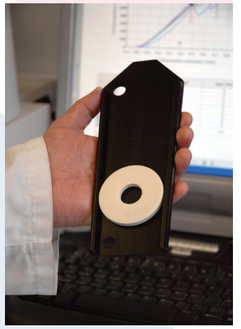
3. Once the kiln firing has taken place and the rings have reached ambient temperature, measure the rings using either the Vector Gauge, or the traditional TR100 long life index Gauge.

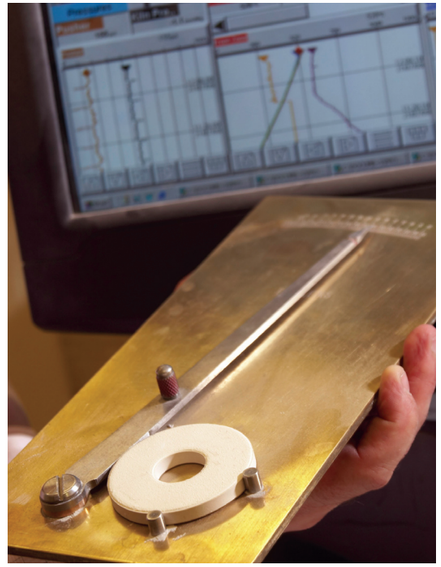


In the case of the Vector Gauge, insert the ring between the two converging guide rails and the reading from the top of the disc against the engraved scale.

When using the traditional TR100 long life index Gauge, ensure that the ring is in contact with both guide posts and that the arm of the gauge is just touching the edge of the ring. The pointer will then indicate the ring value. The ring should be rotated through 90° and an average of 4 readings should be taken.

4. Record the ring number on to the kiln record sheets and compare against previous data.





Bullers Rings are world famous for measuring Heat Work

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How to Interpret the Results from your *Bullers Rings*

1. The results from the *Bullers Rings* should be compared against historical data where available.

If *Bullers Rings* are being used for the first time, the data should be recorded for calibration with future deliveries.

2. High readings indicate that more *Heat Work* has taken place, either locally or overall. Possible causes are:

- An increase in peak temperature
- An increase in time at peak temperature
- Reduced kiln load

The remedies will be specific to the individual kiln, but typical areas to investigate are:

- Check burner operation
- Check damper operation
- Check kiln pressure
- Check for reduced kiln load
- Check kiln reference thermocouple setting

Low readings indicate that less Heat Work has taken place, either locally or overall. Possible causes are:

- Increased setting load (higher density)
- Leaking temperature
- Peak temperature not reached
- Kiln loading too dense – reduced air flow

The remedies will be specific to the individual kiln, but typical areas to investigate are:

- Check element integrity (electric kiln)
- Check kiln seals
- Check damper seals
- Check kiln lining

In the case of localised low readings (cold spots):

- Modify the burner ratio (gas kiln)
- Balance out the kiln pressure
- Modify heat input pattern

All kilns and products are different and there is no single solution to under or over firing. The condition of the kiln and the product being fired should be checked for changes and modifications should only be carried out by suitably trained technicians.

Ring Number to Temperature Comparison Chart

	Very Low Temp Ring No 89	Low Temp Ring No 55
Approx Temp °C	Gauge Reading	Gauge Reading
750	2.5	
760	3	
770	3.5	
780	4.5	
790	5.5	
800	7.25	
810	10.25	
820	12.75	
830	15.75	
840	18.5	
850	21.5	
860	24.25	
870	27.25	
880	30.25	
890	33.25	
900	36.25	
910	39.75	
921	43.5	
930	47.75	
940	51.75	
950	55.5	
960	57.5	3
970	59.25	7
980	60	11
990	60.5	15
1000	61	18
1010		21
1020		24
1030		27
1040		30
1050		32
1060		34
1070		36
1080		37
1090		38
1100		39

	Standard Ring No 27	Extended Temp Ring No 75	High Temp Ring No 73
Approx Temp °C	Gauge Reading	Gauge Reading	Gauge Reading
960	0	0	
970	1	1	
980	2.5	2	
990	4	3	
1000	5.5	4	
1010	7	5	
1020	8.5	6	
1030	10	7	
1040	11.5	8.8	
1050	13	10	
1060	14	11	
1070	15.5	12.5	
1080	17	14	
1090	18.5	15.5	
1100	20	17	
1110	21.5	18.5	
1120	23	20	
1130	24.5	21	
1140	26	22	
1150	27	23	
1160	28.5	24.5	
1170	30	26	
1180	31.5	27	
1190	33	28	
1200	34.5	29	
1210	36	30	
1220	37.5	31	
1230	38.5	32	
1240	40	33	
1250	41.5	34.5	
1260		36.5	
1270		38.5	
1280		40	29.5
1290		42	30.25
1300		44	31
1320		46	34
1340			37
1360			40.5
1380			44
1400			48
1420			51

How to Calibrate *Bullers Rings*

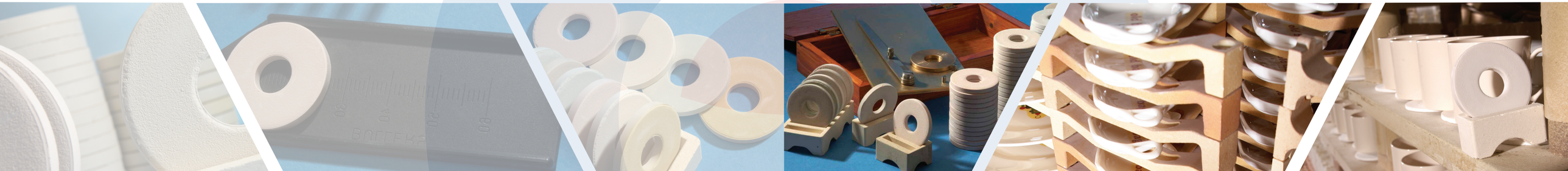
Once you receive your next delivery of *Bullers Rings* it is necessary to calibrate them against your existing batch.

Place existing rings on the kiln for normal use but also place a ring from the new delivery next to a ring from those in current use. Once the firing has been completed, measure the two sets of rings. In many cases the two sets of results will be almost equal. However, in practice, there may be slight differences between the two sets of readings.

As an example, if the existing rings give readings of 30 to 32, (average 31) and the newly delievered rings give readings of 31 to 33 (average 32), a correction factor of -1 (31-32 = -1) should be used when comparing the performance of firings measured by the existing rings with that of the new rings. Therefore all readings from the new delivery should have 1 point deducted to be the same.

Reference List

Amarin Ceramics Corp Ltd
American Standard
Arenas Minerales SL
British Ceramic Tile Ltd
Ceramic Instruments SRL
Ceramics R Us Corp Ltd
Ceric
Churchill China UK Ltd
Duchess China Ltd
Dudson Ltd
Elkelm 2 - Distribuicao de Producto
Emma Bridgewater Ltd
Fairey Industril Ceramics
Fuokee Ind. Corp Richard
G. Vogler BV
Global Ceramic Materials Ltd
Grothe Rohstoffe GMBH & Co KG
Heide GMBH
Ibstock Brick Ltd
Ideal Standard
Imerys
Jacob Delafon Maroc SA
Wedgwood
Kohler (Thailand) Public Co Ltd
Portmeirion Potteries Ltd
PT Doulton
Refracon SDH BHD
Refractory & Ceramic PTY Ltd
Ross Ceramics Ltd
Sin Hong Paints Ltd
Steelite International Plc
The Denby Pottery Co Ltd
Baker Harrison Ltd
Wienerberger



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