Process Temperature Control Rings from 660°C up to 1,750°C

The **PTCR** is a highly accurate ceramic device that registers the total amount of heat transferred to it and the fired product. PTCR takes account of both radiated and transferred heat, as well as the effects of temperature over time. It conveniently allows this recorded heat exposure to be expressed as a single number - ring temperature (RT) - which is practical and easy to work with.
The rings can be used in both batch and continuous tunnel kilns; they are used in a range of atmospheres, including oxygen, nitrogen, air and vacuum. Six different PTCR types are available – in heights of 3.5 mm and 7.0 mm – covering a range from 660°C to 1,750°C. Ring types are identified by colour coding and batch and type numbers pressed into the ring.
Originally PTCR has been developed for in-house application in critical firing processes for advanced electronic ceramic components. Now, the PTCR brings the benefits of easy, accurate kiln heating measurement to a wide range of industries.
The entire PTCR manufacturing facilities have been awarded the internationally recognized ISO 9001:2000 and ISO 14001 quality certification.

HOW IT WORKS

When exposed to heat in the kiln & furnace, the PTCR contracts – and continues contracting as the top temperature is maintained over time. The degree of contraction is almost linear over the complete operating range of the PTCR, providing a practical measure of the accumulated heat to which the ring – and the fired products – have been subjected. The amount of contraction – the amount by which the ring diameter has shrunk – is measured with a digital micrometer. This measurement can be converted to 'ring temperature' for ease of comparison and correlation to the firing process (temperature tables are supplied with the rings).

QUALITY YOU CAN RELY ON

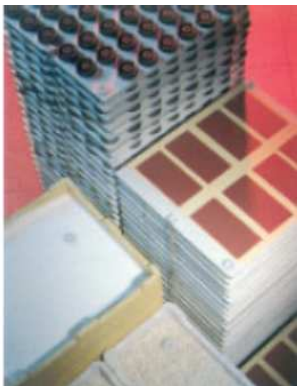
PTCR is recognized for its accuracy and reliability, and is recently improved technology now offers an unsurpassed accuracy guarantee – a maximum variation of no more than 3°C ring temperature (RT).This reliability is based on a stringent manufacturing process. PTCR are made from a mix of high-grade materials. Their composition is fine-tuned through advanced Design Of Experiments-(DOE) techniques, and the production process itself is controlled by Statistical Process Control.

AVAILABLE RANGE OF PTCR

Temperature range	Type	Colour
660 - 1,000°C	RTC - AQS	green
850 - 1,100°C	PTCR - ETH PTCR - ETL	pale green
970 - 1,250°C	PTCR - LTH PTCR - LTL	pink
1,130 - 1,400°C	PTCR - STH PTCR - STL	green
1,340 - 1,520°C	PTCR - MTH PTCR - MTL	yellow
1,450 - 1,750°C	PTCR - HTH PTCR - HTL	white

PTCR ring dimensions: outer diameter 20 mm, inner diameter 10 mm, height 7.0 (type no. ends with H)or 3.5 mm (type no. ends with L)

POSITIONING



PTCR can be placed at almost any location in the kiln, on kiln furniture, trolleys or transporters. The use of both multilocation and multi-level positioning is recommended, as this provides the most insight into the treatment distribution within the kiln.

MEASURING

The contraction of the PTCR diameter reflects the actual heat treatment at the place where the ring was located in the kiln. The diameter is easily measured using a PTCR micrometer – only a single measurement is required (as shown). PTCR micrometers have an integral, ergonomically designed solid base with a ring positioning chuck, which ensures the ring is always correctly positioned in the micrometer. This design not only simplifies the measuring process, but also improves the repeatability and reproducibility of ring temperature measurement. Correct positioning is essential to allow accurate ring diameter reading in a single measurement. The special PTCR micrometers feature a positioning chuck that assists in the placement of the ring, helping to ensure that measurement is made correctly – across the middle digits of the ring number. But there is also an electronic calliper for quick measurement available in a practically box (as shown).

CONVERTING TO RING TEMPERATURE

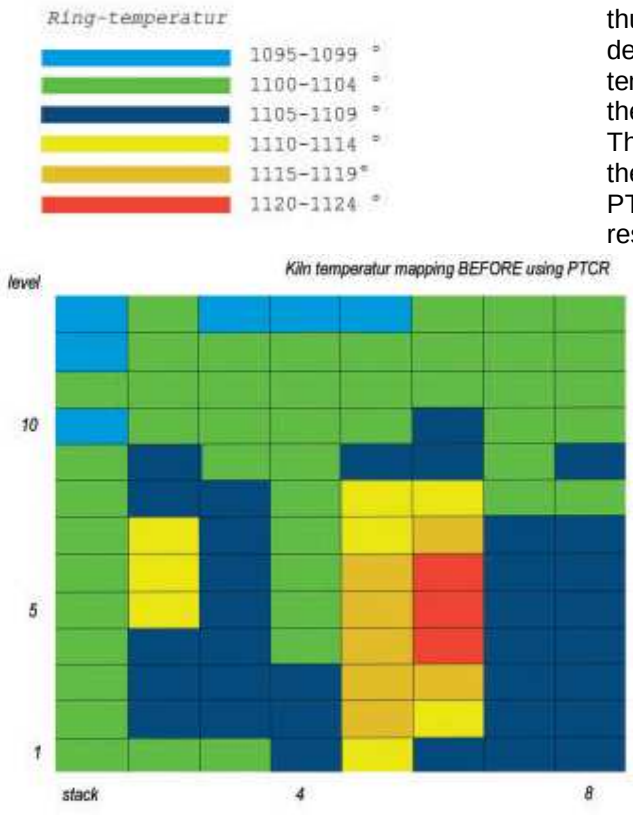
The measured ring diameter is converted to ring temperature using the conversion table enclosed in each packing unit. Each table is specific to the particular batch of rings, for accuracy and convenience. The ring temperature is a practical single number which is useful for comparison purposes – for instance to relate the recorded heat treatment to the firing process and defined standards – so that any required adjustments can be made. It does not necessarily reflect the actual kiln temperature; the PTCR acts as an accumulator, measuring the total heat treatment over time, rather than the maximum temperature attained.

ESTABLISHING A STANDARD RING TEMPERATURE

In order to make ring temperature comparisons between different firings, a standard ring temperature must be defined. This is done by including PTCR in a series of firings, and relating their ring temperatures to the quality of the products produced. The ring temperature which corresponds to products fired to the correct specifications can be used as the standard.

FIRING PROCESS OPTIMISATION

In the process of establishing a standard, the firing process is characterized by mapping the ring temperatures of PTCR distributed throughout the kiln. This allows the “hot” and “cold spots” to be detected and defined.
Using the heat treatment mapping, the firing process can than be optimised by offsetting heat sources or thermocouples as indicated by the variations in ring temperatures. As a rule of thumb, one degree of ring temperature corresponds to one degree Celsius. The exact relationship between ring temperature and degrees Celsius is of course dependent upon the specific firing cycle of the kiln.
The adjoining illustration shows two heat treatment mappings of the same 15 m^3 kiln. The first was generated before using the PTCR, the second after firing process optimization using PTCR, resulting in substantial yield improvement.



FIRING PROCESS CONTROL

In the course of time – as a result of aging of the heating elements or frequently alternating firing cycles – “hot” and “cold spots” may gradually return to the kiln. The PTCR can help here, too. Once the firing process has been optimised, PTCR can be used regularly to monitor the firing process and to detect these deviations as they gradually arise, before they affect product quality.
By comparing the current ring temperatures against the defined standard, the number of degrees of ring temperature by which the firing process must be adjusted can be determined. Using several rings at critical locations in the kiln ensures that an even heat distribution is maintained.

QUALITY CONTROL AT LOWER COST

Besides the benefits of yield improvement through optimisation of firing process, the PTCR can also help reducing production costs. Simple comparison of ring temperature against a quality standard indicates whether the products are sintered to specification. Expensive, time-consuming conventional quality checks – destruction testing, geometry, density and porosity tests – can be reduced or eliminated.

PACKING

15 pc. / small paper boxes
600 rings in a solid shipping box