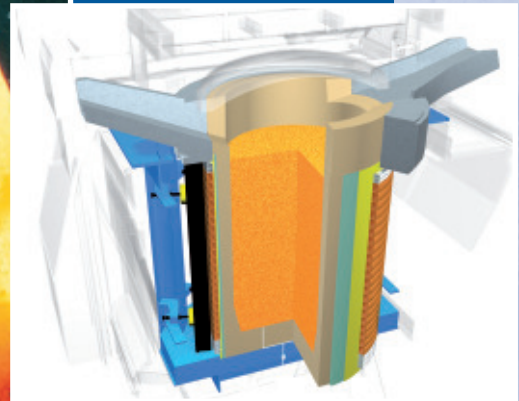
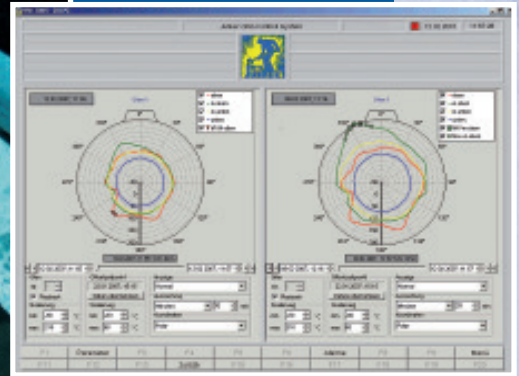
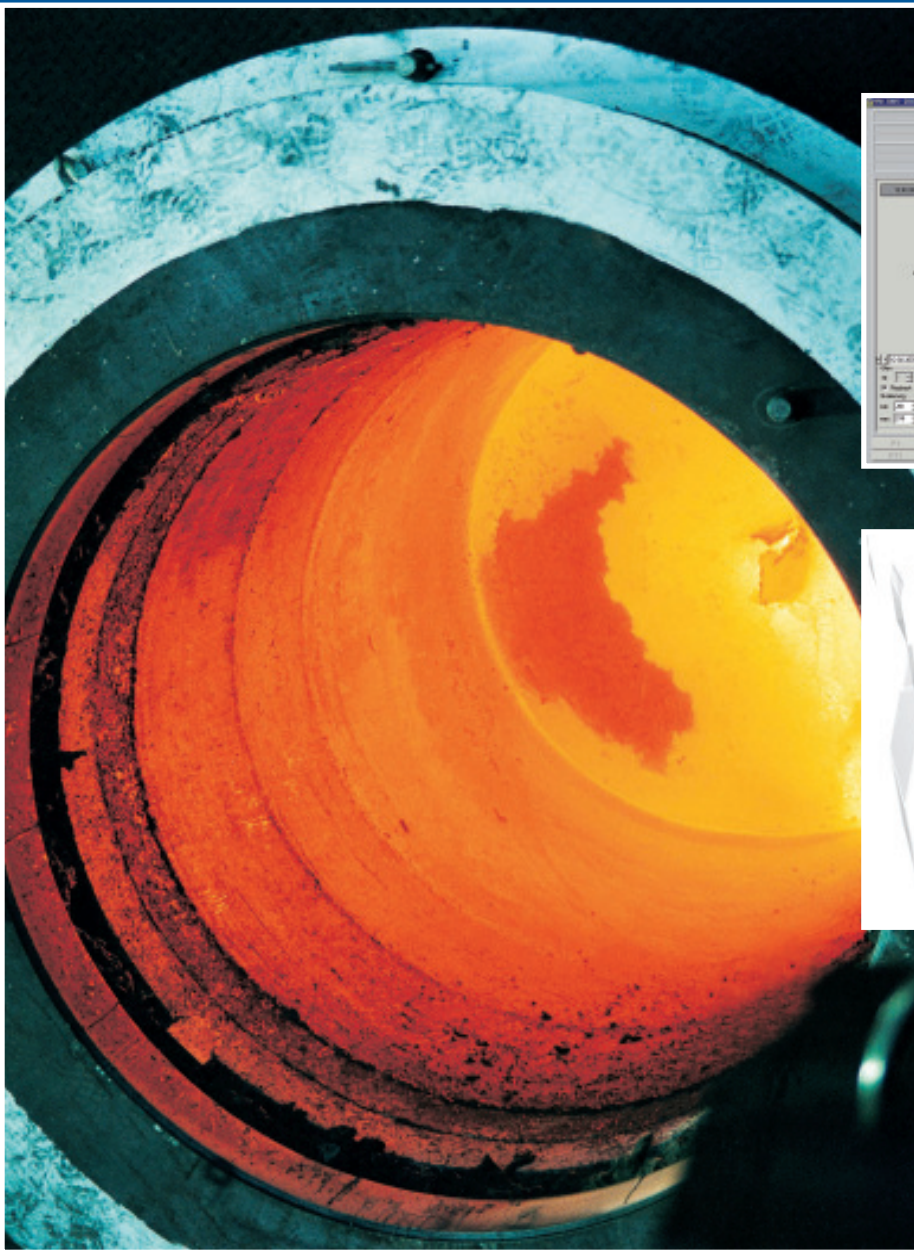




OTTO JUNKER

We understand Metals

OCP - Optical Coil Protection



“Safety First”

OTTO JUNKER Group
Global and Close to the Customer

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What is OCP?

The OCP principle

OCP is a temperature measuring and monitoring system of the latest generation based on optical fibre sensors. Thanks to their measuring characteristics these sensors lend themselves particularly well to interference-free crucible monitoring in induction melting furnace applications.

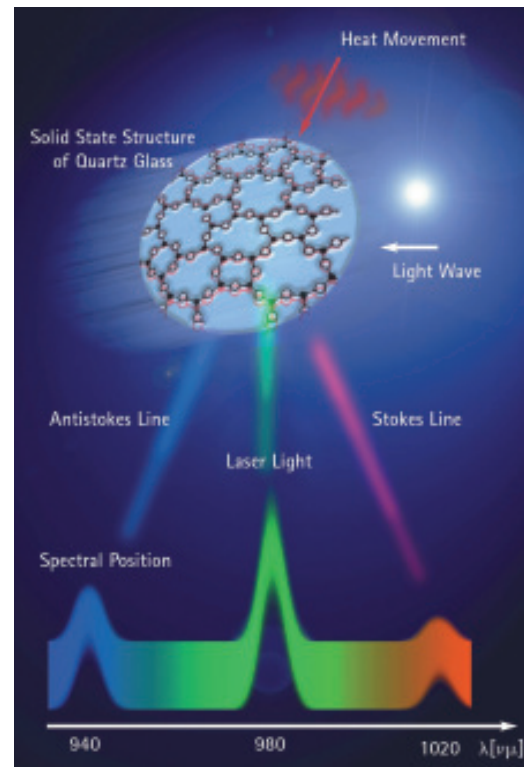
Thus OCP is a unique crucible monitoring system making it possible for the first time ever to determine the temperature field in the induction furnace irrespective of refractory type and design.

The physical principle

Based on an optical fibre the system utilizes a quantum-mechanical effect, the so-called RAMAN effect, for temperature measurement. The system injects laser light of suitable wave length and modulation frequency into the optical fibre. This laser light scatters on the bonding electrons of the solid state structure over the full fibre length and is detected as a backscatter spectrum. This spectrum contains the RAMAN lines, the intensity of which is a function of the solid state fibre structure vibration which in turn depends on temperature. A new, patented 'optical radar technique' makes it possible to detect these lines locally and to measure an exact, high-resolution temperature profile around the crucible circumference online.

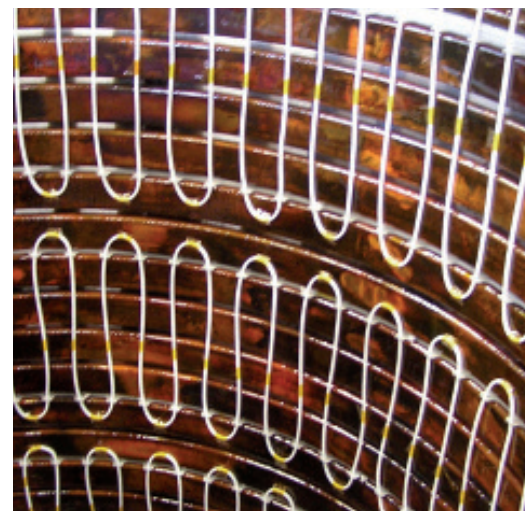
Benefits of the OCP system

- Full protection against
 - ▶ Operational breakdown due to coil damage
 - ▶ Bodily injury and equipment damage due to molten metal breakthrough
- Recording and visualisation of temperature profile over the entire crucible campaign
 - ▶ You can see developments and trends of refractory wear or metal penetration
 - ▶ You can take action in good time to extend refractory lifetime
- Direct temperature measurement, not via resistance
- ▶ Fully operative for a vast variety of refractories and immediately after relining
- Optical measuring method, not electrical
 - ▶ This does away with false signals or even sensor cable damage by the magnetic field of the induction furnace
- One single evaluator can monitor up to four furnaces
- Very high resolution, e.g. 60 spots over the circumference of an 8-tonne furnace crucible, like the second marks on a clockface



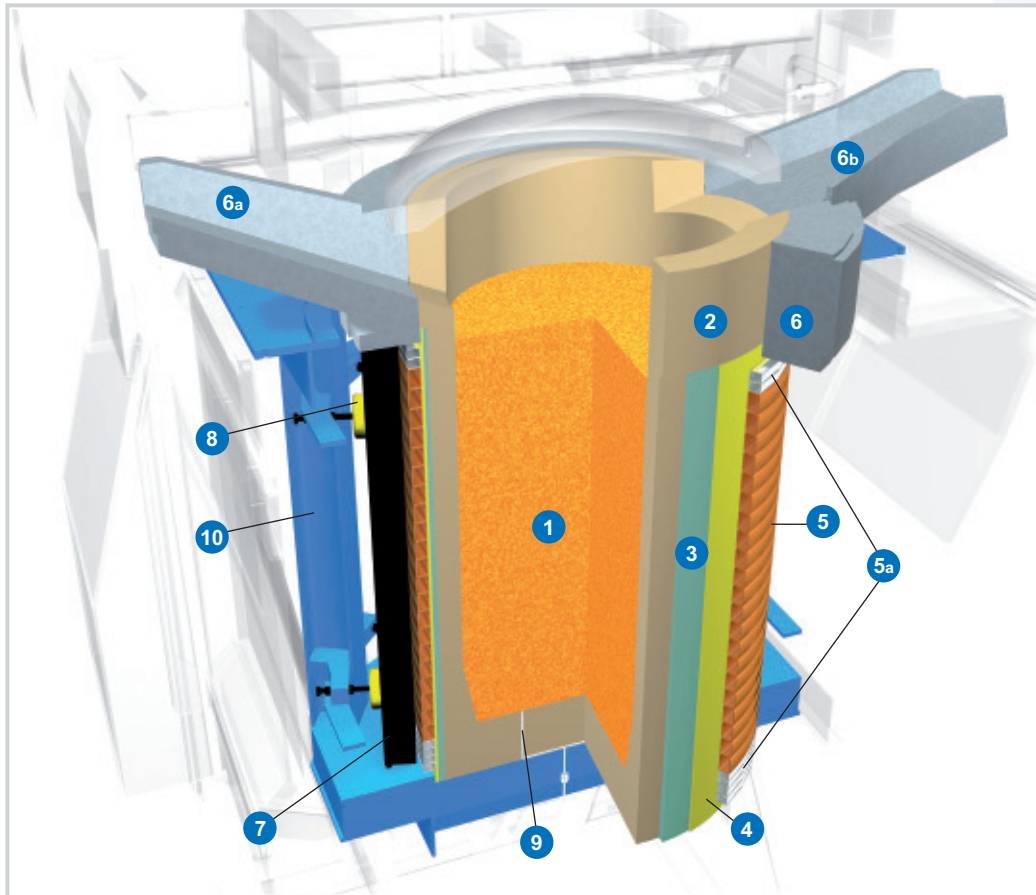
RAMAN effect

- Up to four measuring zones over the height of the furnace coil
- Temperature measurement with a relative accuracy < 1 K



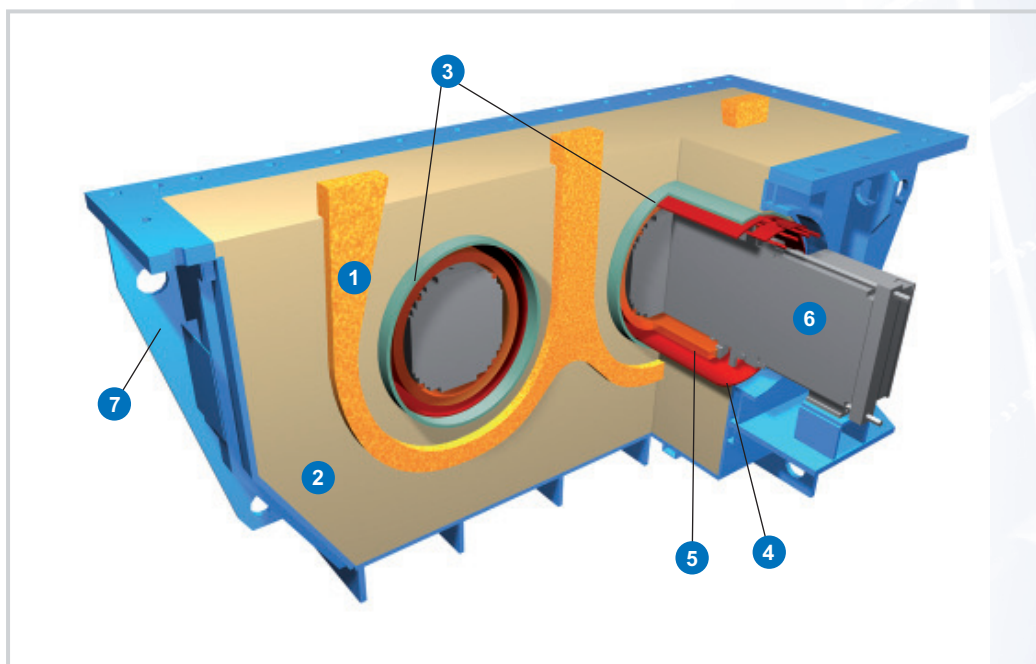
Arrangement of the OCP sensor cable in a 12-tonne furnace

The OCP system in a coreless induction furnace



- 1 molten metal bath
- 2 refractory crucible
- 3 heat insulation layer
- 4 permanent lining with embedded OCP sensor cable
- 5 power coil
- 5a cooling coil
- 6 furnace top
- 6a pouring spout
- 6b deslagging spout
- 7 yoke
- 8 vibration absorber
- 9 earth rod for earth leakage monitoring
- 10 coil cage

The OCP system in a channel-type induction furnace



- 1 molten metal bath
- 2 refractory
- 3 OCP sensor cable
- 4 cooling shell
- 5 power coil
- 6 inductor core
- 7 inductor casing

The OCP program functions

Visualisation

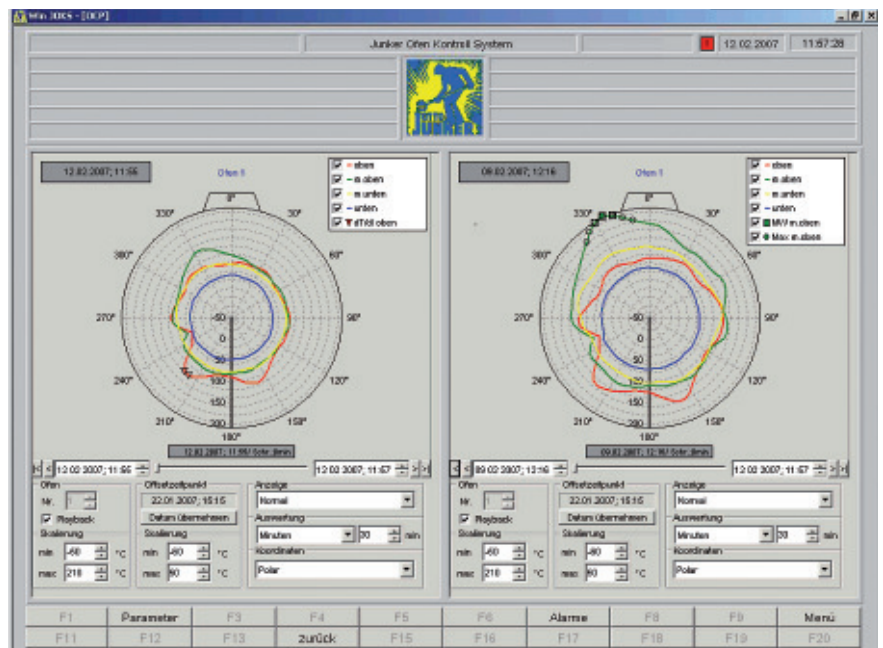
- Temperature as well as local temperature gradient and temperature rise per time period in the immediate vicinity of the coil with high resolution

Evaluation

- Current temperature profile
- Recording and accelerated playback of crucible campaign

Monitoring

- Temperature gradient alarm
- High temperature alarm



Installation of the OCP system

- **For new equipment:**
 - ▶ High economic efficiency. The sensor cable is embedded in the permanent lining (and therefore not lost on relining).
- **Retrofitting to existing furnaces:**
 - ▶ No modification to the existing furnace. Only two lead-outs of about 15 mm diameter are needed on the coreless furnace.



One evaluator monitors two furnaces (max. four furnaces).

Technical data:

Temperature accuracy (relative):
< 1 K

Resolution:
e.g. 60 zones over the crucible circumference, up to four zones over the height

Temperature range:
up to 250 °C (continuous)

 **OTTO JUNKER**

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