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- Rotary Kiln Test
- Induction Melting Aggregates
- Wedge-Splitting Test
- Quantitative Oxidation Test
- Friction Wear
- Blast Wear
- Computer-Aided Thermochemistry
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# Gas Permeability

of Refractories

at Elevated Temperature

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Hot gas permeability is an important property for many applications when using refractory materials. Practical service requirements may call for gas tightness as well as a defined degree of gas permeability. The gas-tight SEN (subentry nozzle) exemplify one product and the permeable purging plug another one. Both are used by the steel industry.

Gas permeability is generally determined according to DIN EN 993-4 at room temperature and minor pressure differences. There is a linear correlation between gas flow volume and differential pressure. At a constant temperature the gas permeability is a material constant provided that no change in microstructure occurs.

### Measuring device

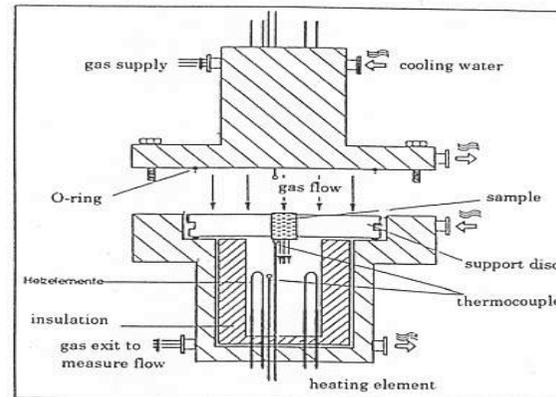
The measuring device consist of 2 separate water-cooled pressure chambers heated up to 1500°C and are arranged on top of one another. The sample (50mm diameter, 50mm height) is placed between them in a gas-tight corundum refractory castable (Fig.1). The measurement can be conducted at a homogenous temperature or at a temperature gradient. The determination of pressure difference is done in front and behind of the sample. The air flow volume is measured at room temperature after passing the hot sample.

### Results

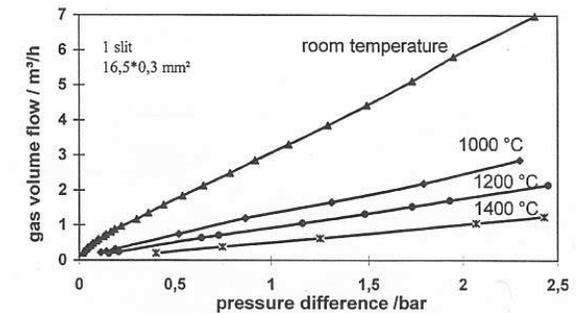
- *Purging plugs with directional porosity*  
Various types of purging bricks with directional porosity were taken to measure gas permeability up to 1,400°C and 2.5 bar pressure (Fig. 2)

- *SEN*

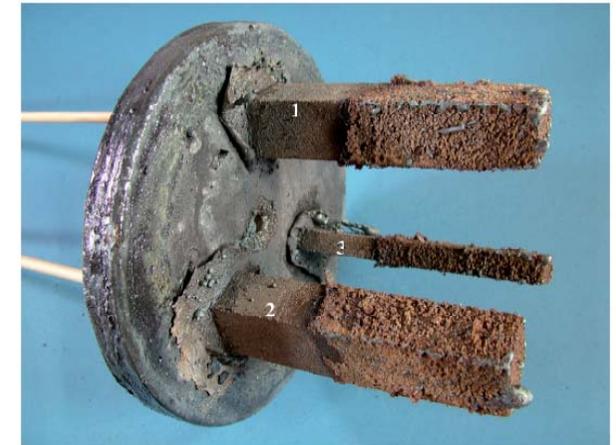
The gas permeability of SEN is very low. Laboratory experiments in Al-killed steel have shown that an interrelation between gas permeability and clogging tendency is not existant. (Fig.3)



**Fig. 1:** Apparatus to determine hot gas permeability.



**Fig. 2:** Apparatus to determine hot gas permeability.



**Fig. 3:** SEN-material after 15 min at 1600°C in a 0,1 wt.-% Al-killed steel melt (1 gassing with air, 2 gassing with argon, 3 reference without gassing)