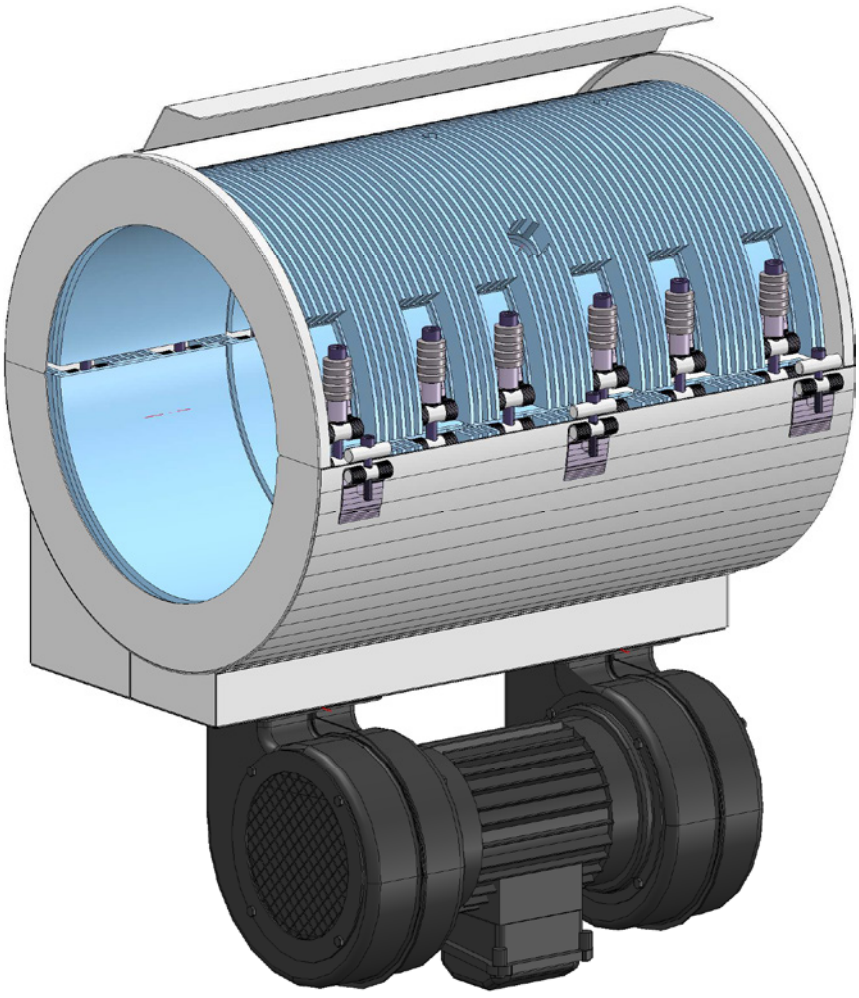
TECHNICAL COMPARISON
HEAT-COOL-COMBINATIONS



GROUP OF COMPANIES

IHNE & TESCH
ELEKTRO-WÄRMETECHNIK

KELLER IHNE + TESCH
ELEKTRO-WÄRMETECHNIK

CELTIC

KIT ELECTROHEAT

HEAT-COOL-COMBINATIONS

TECHNICAL COMPARISON

The application of Heat-Cool-Combinations will result in rapid and effective heating and cooling coupled with energy-efficiency.

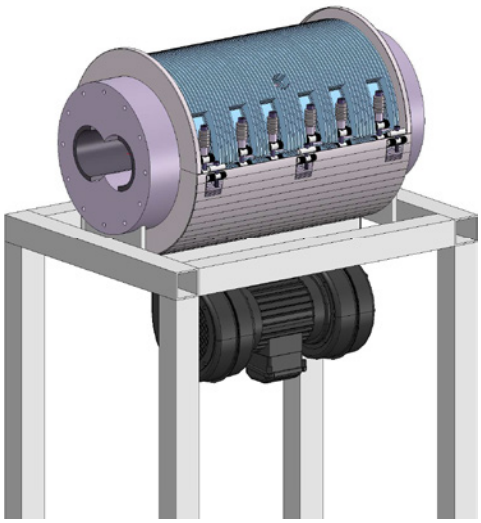
Conventional systems such as HKK (ceramic) or HKC (ceramic with copper cooling fins) give fast heat-up times but without uniform temperature distribution along the heated area as achieved by the HAK system.

With its compact design and heating elements inclosed in high heat conductive aluminium small temperature differences along the screw barrell can be achieved.

Stresses and material deposits are reduced or even avoided. High machine productivity and product quality are supported and encouraged.

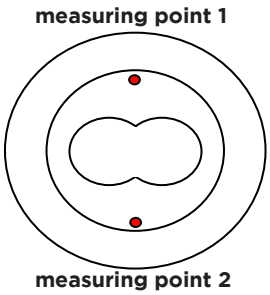
Test set up

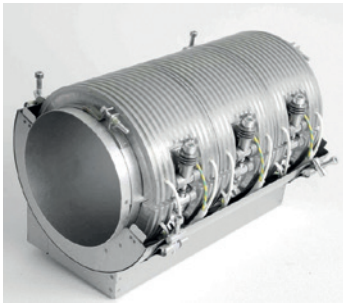
HKK 225D 360L 230V 4800W
HAK 225D 360L 230V 4800W



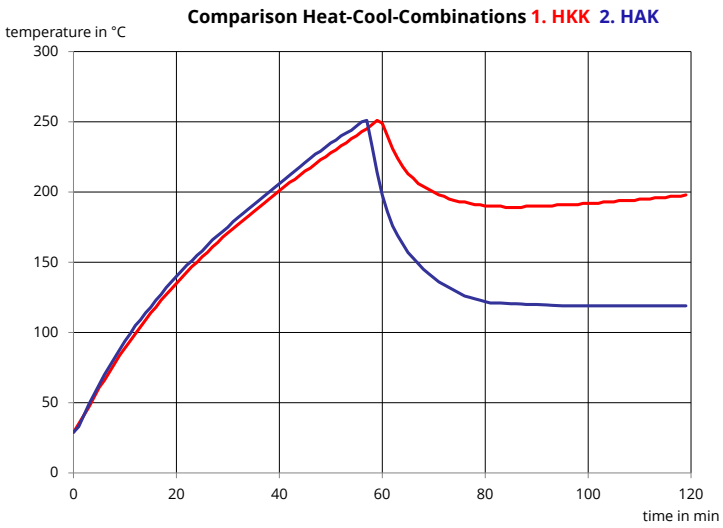
Test procedure

1. **heat up cylinder to 250°C (measuring point 1) via the heating elements HKK or HAK**
2. **turn off Heat-Cool-Combinations, turn on the internal heating elements (8 kW) and the blower**





Variation-diagram: heat-up and cool-down behaviour



Due to the enlarged radiating surface and the use of aluminum as heat and energy element a significant increase in performance is achieved.

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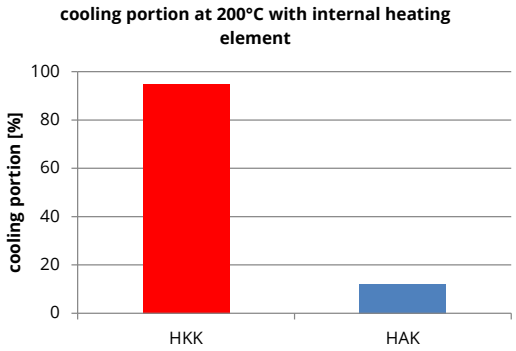
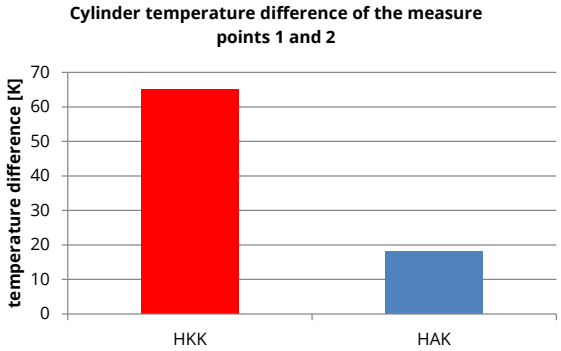
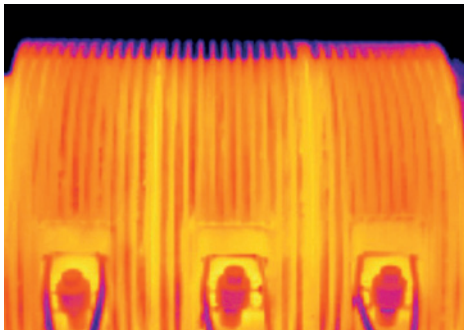
Cooling energy demand



In the cooling cycle (see fig. on left) high energy for cooling is required with the convential HKK compared to the new HAK. In order to maintain the set temperature constant, the HAK requires less energy consumption compared with conventional ceramic-insulated Heat-Cool-Combinations. The minimum temperature can be maintained even in difficult areas and will also help to increase the material throughput.

Temperature uniformity in the screw barrel





The uniform temperature spread along Cylinders with extrusion lines (see right hand figure above) is particularly significant. By using the HAK not only the throughput and product quality can be improved, but also taken influence on the material (negative voltage build-up). The isothermal temperature distribution of the HAK on the cylinder simultaneously causes a uniform material cooling, which helps to avoid cylinder stresses.

Temperature distribution and airflow HAK

Simulation of the temperature distribution and air flow in a 3D model

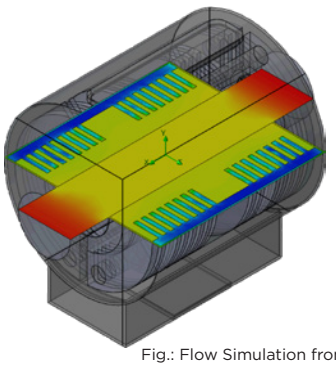


Fig.: Flow Simulation from Mentor Graphics

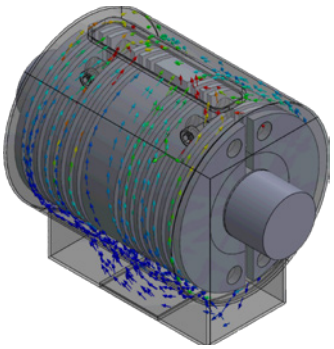


Fig.: Flow Simulation from Mentor Graphics

With the "HAK" the heating works on the contact side across the entire zone length and thus ensures an even heat distribution. The arrangement of the cooling fins occurs an enlargement of the radiating surface and provides a good air circulation in the cooling jacket.

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HCC comparison 09/2020

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