

# TA

## Temperature Analysis Cross Section

The TA application allows the calculation of temperature fields in rectangular and circular concrete cross sections exposed to fire in accordance with the appropriate National Annex to Eurocode. The cross sections may have any dimensions typical for reinforced concrete.

The fire load is taken into account via the standard temperature-time curve as per EN 1991-1-2.

Currently, the temperature analysis in the cross section is directly accessible out of the Frilo applications B2 Reinforced Concrete Design and B5 Reinforced Concrete Column.

### Input parameters

- Component moisture: 1 - 3 %
- Bulk density of the concrete [T = 20°C]:  
 $\rho = 2200 - 2500 \text{ kg/m}^3$
- Heat transmission coefficient  
 $\alpha_c = 25 \text{ W/(m}^2\text{K)}$  for the exposed side  
 $\alpha_c = 4...9 \text{ W/(m}^2\text{K)}$  for the opposite (unexposed) side
- Emission value of the component surface:  
Concrete:  $\epsilon_m = 0.7$
- Thermal conductivity:  
Concrete: between upper and lower limit

### Basis of calculation

In terms of mathematics, the transient heat conduction in a solid body is described with a partial differential equation of second order. Since material properties such as heat conductivity, bulk density and specific thermal capacity depend on temperature, the solution is obtained numerically with the help of the Finite Element Method.

At the borders, thermal radiation and convection must be taken into account in addition.

In the temperature analysis of reinforced concrete cross sections, reinforcement is neglected.

