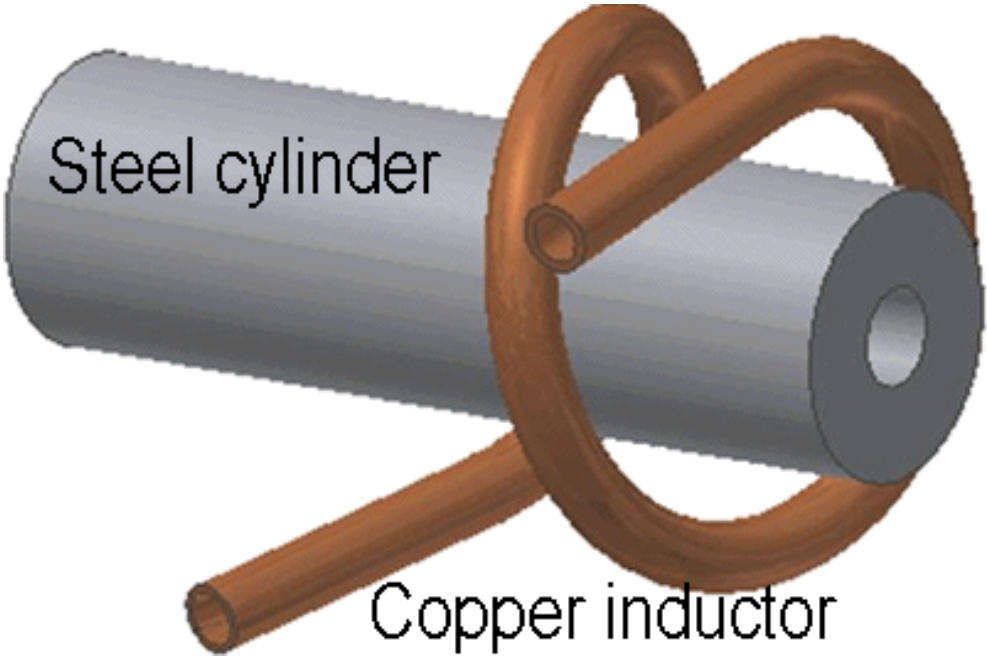
QuickField simulation report

Copper inductor with a steel tube

A 2-turns copper indutor is used to heat steel cylindrical part. Calculate temperature distribution in the steel part after 10 seconds of heating.



This automatically generated document consists of several sections, which specify the problem setup and finite element analysis simulation results. Navigation links in the top of each page lead to corresponding sections of this report.

Problem description and QuickField simulation files:
https://quickfield.com/advanced/copper_inductor_steel_tube.htm

Problem info

Problem type: Transient Heat Transfer (integration time: 10 s.)
Geometry model class: Axisymmetric
Problem database file names:

- Problem: *inductor_heat.pbm*
- Geometry: *Inductor.mod*
- Material Data: *Inductor_heat.dht*
- Material Data 2 (library): *none*
- Electric circuit: *none*

Results taken from other problems:

- *Generated Heat: Inductor_magn.pbm*

Geometry model

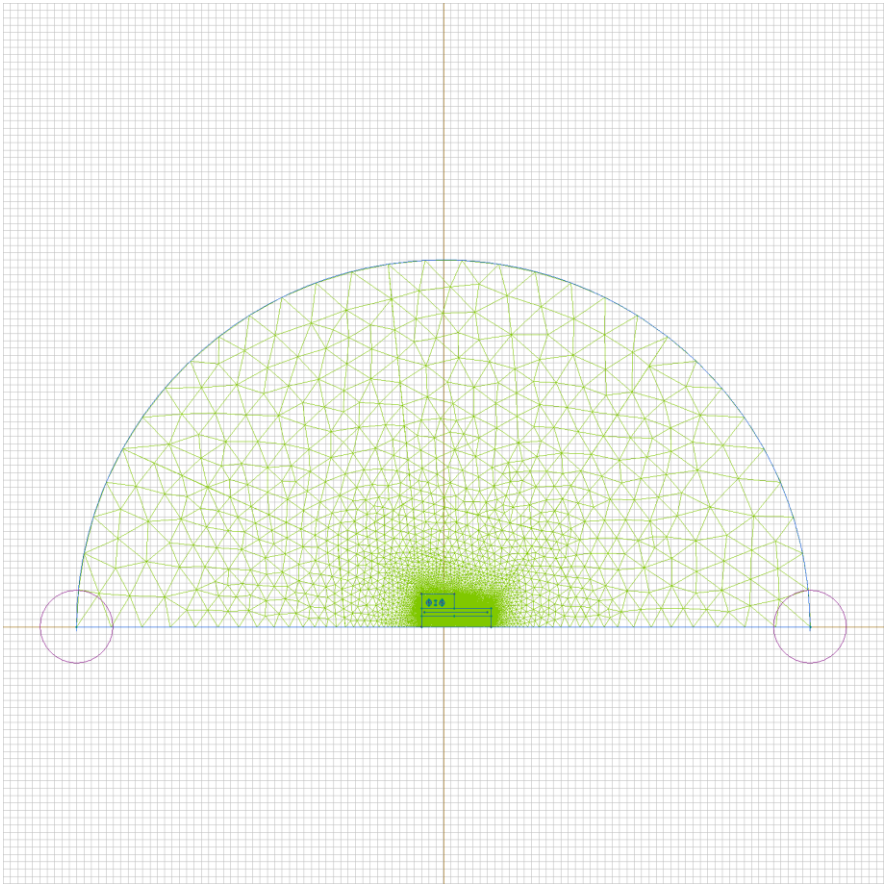


Table 1. Geometry model statistics

	With Label	Total
Blocks	4	8
Edges	2	26
Vertices	0	28

Number of nodes: 516262.

Labelled objects

There are following labelled objects in the geometry model (Material Data file could contain more labels, but only those labels that assigned to geometric objects are listed)

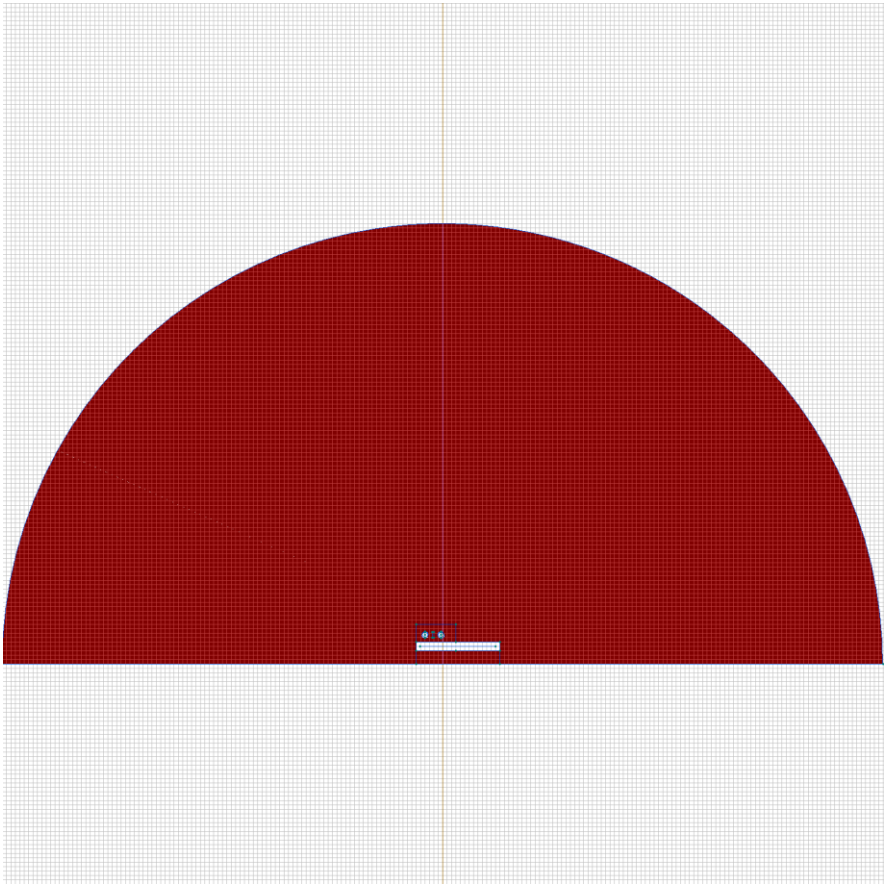
Blocks:	Edges:	Vertices:
• air • water • conductor • steel •	• convection • boundary •	

Detailed information about each label is listed below.

Labelled objects: block "air"

There are (3) objects with this label

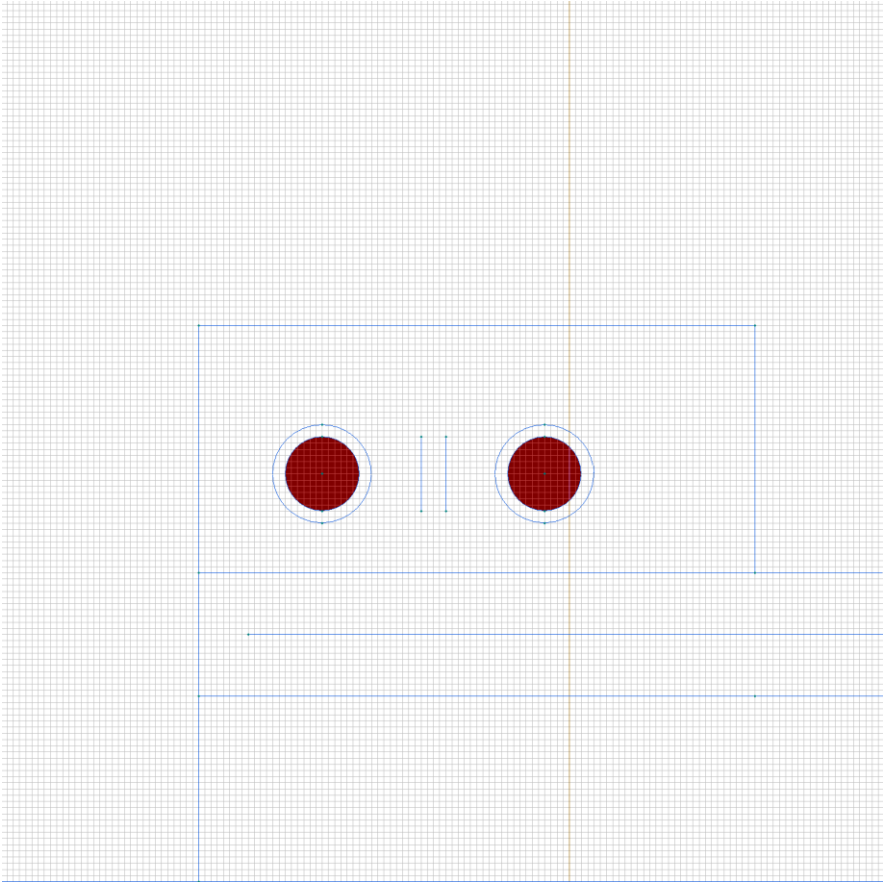
Thermal conductivity: lambda_x=0 [W/(K*m)], lambda_y=0 [W/(K*m)]



Labelled objects: block "water"

There are (2) objects with this label

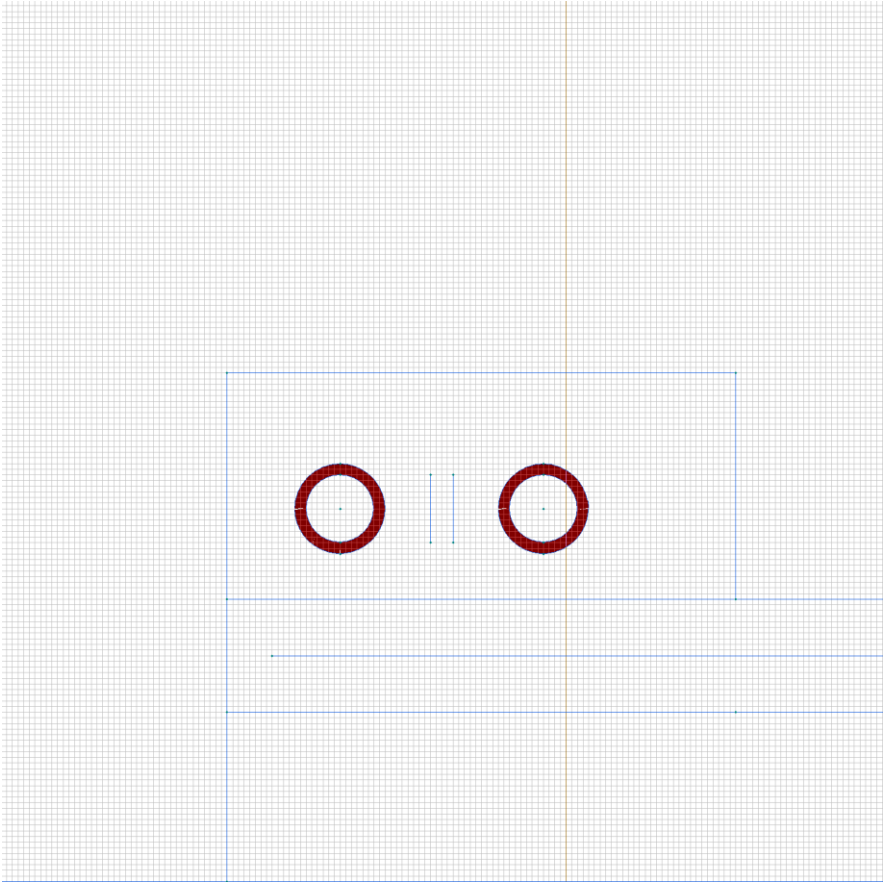
Thermal conductivity: lambda_x=0 [W/(K*m)], lambda_y=0 [W/(K*m)]



Labelled objects: block "conductor"

There are (2) objects with this label

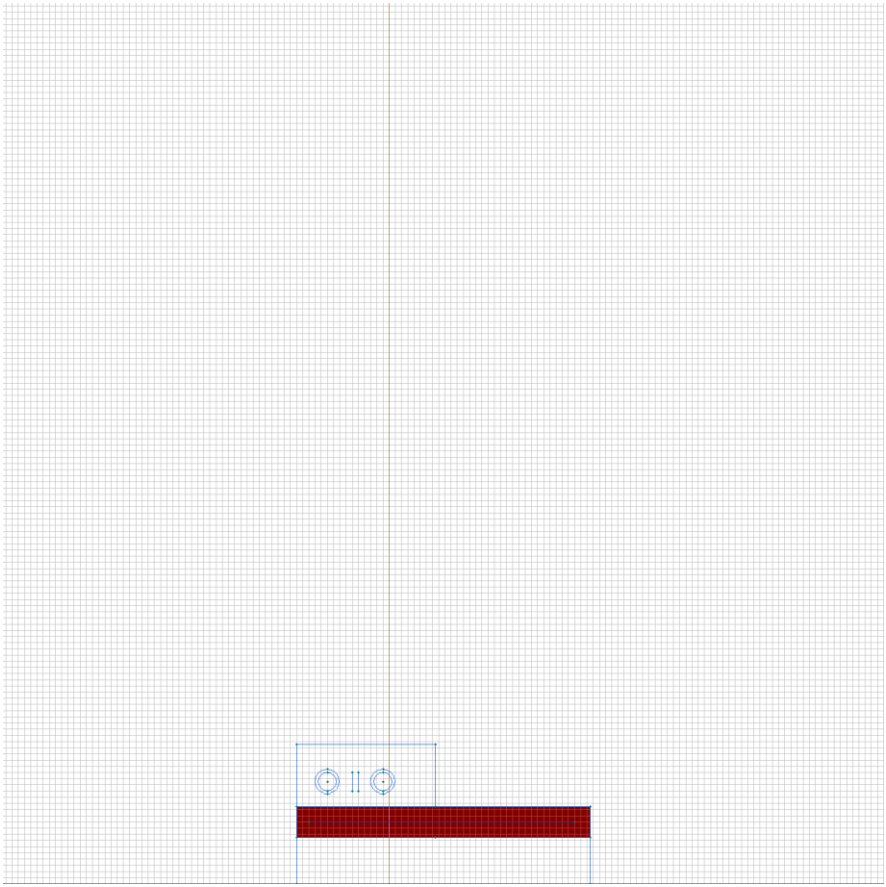
Thermal conductivity: lambda_x=0 [W/(K*m)], lambda_y=0 [W/(K*m)]



Labelled objects: block "steel"

There are (1) objects with this label

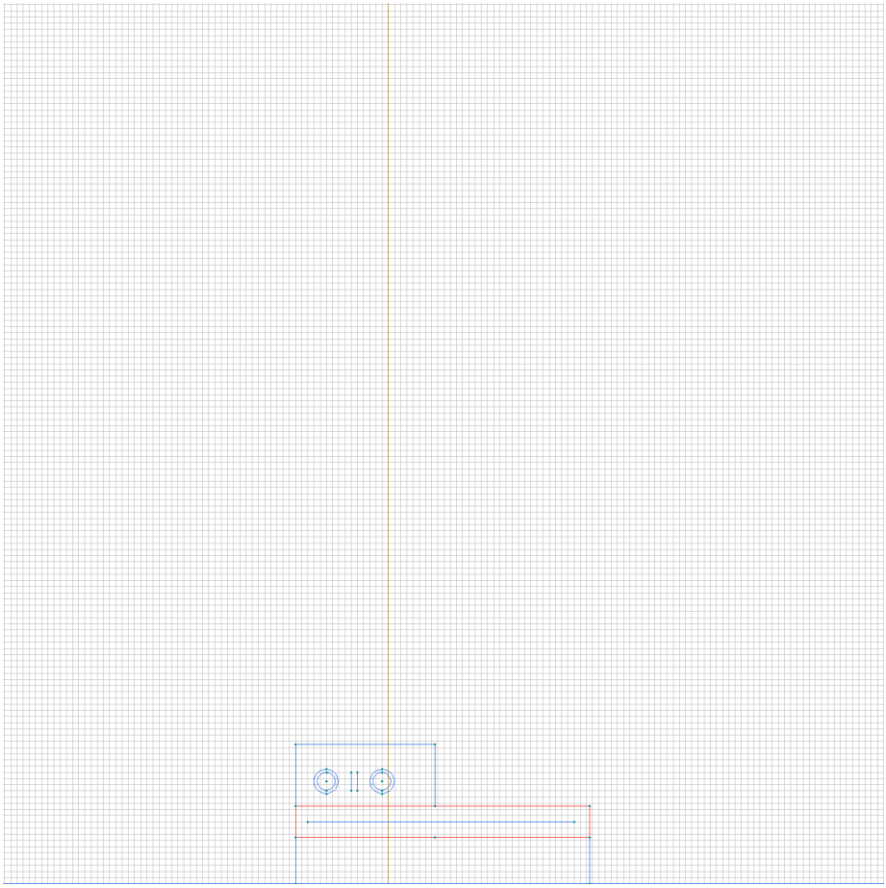
Thermal conductivity: lambda_x=20 [W/(K*m)], lambda_y=20 [W/(K*m)]
Specific heat: C=200 [J/(kg*K)]
Mass density: rho=7800 [kg/m3]



Labelled objects: edge "convection"

There are (6) objects with this label

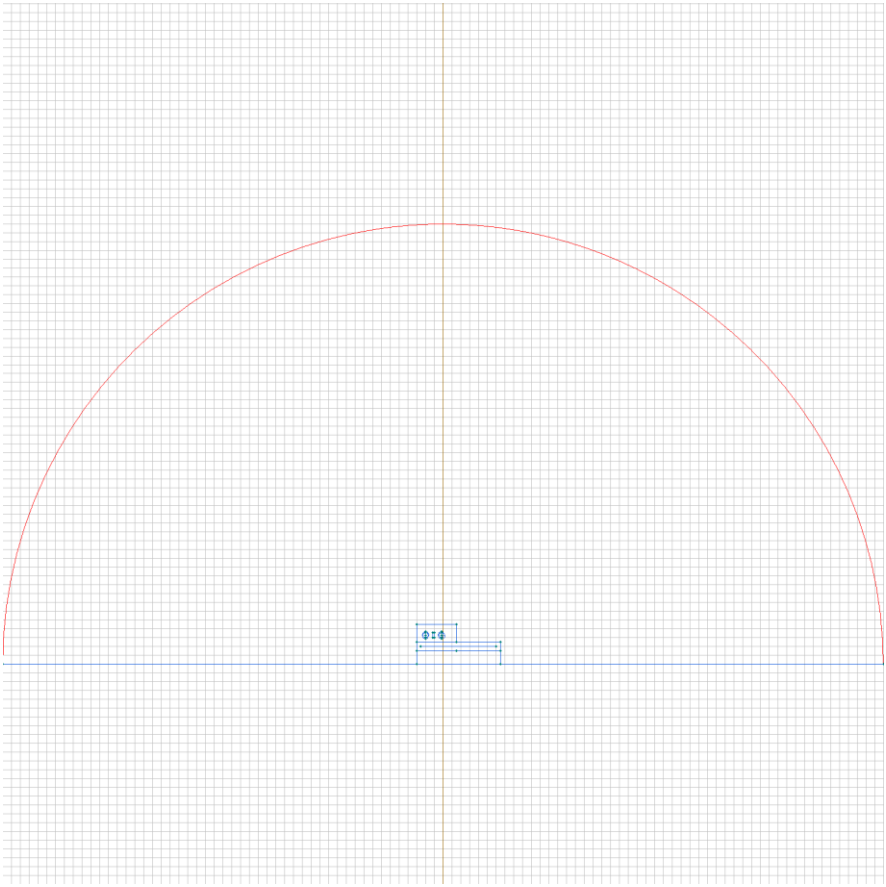
Convection: alpha=50 [W/(K*m2)], temperature T0=20+273,K [K]



Labelled objects: edge "boundary"

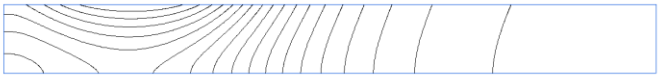
There are (1) objects with this label

No material data (boundary conditions) are specified



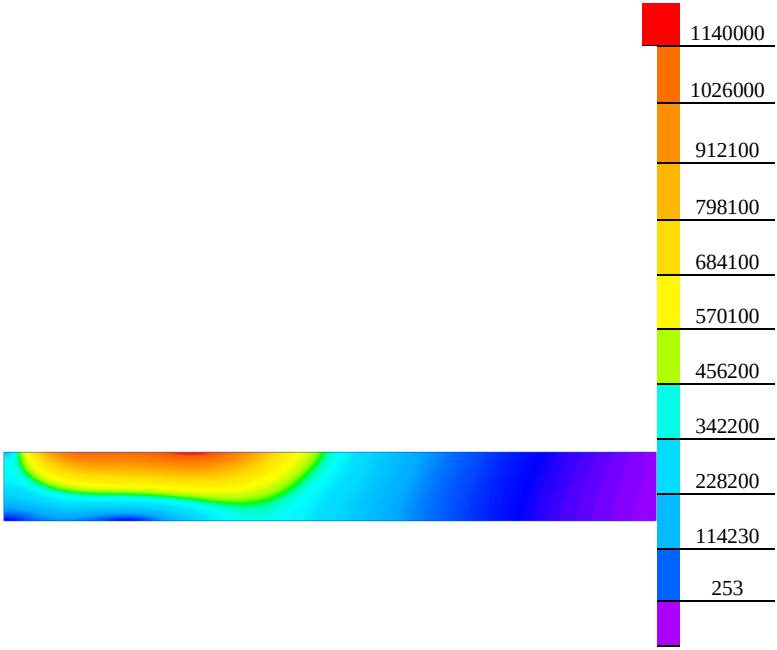
Results

Field lines



Results

Color map of Heat flux |F| [W/m2]



Nonlinear dependencies

No non-linear dependencies are used in this problem data