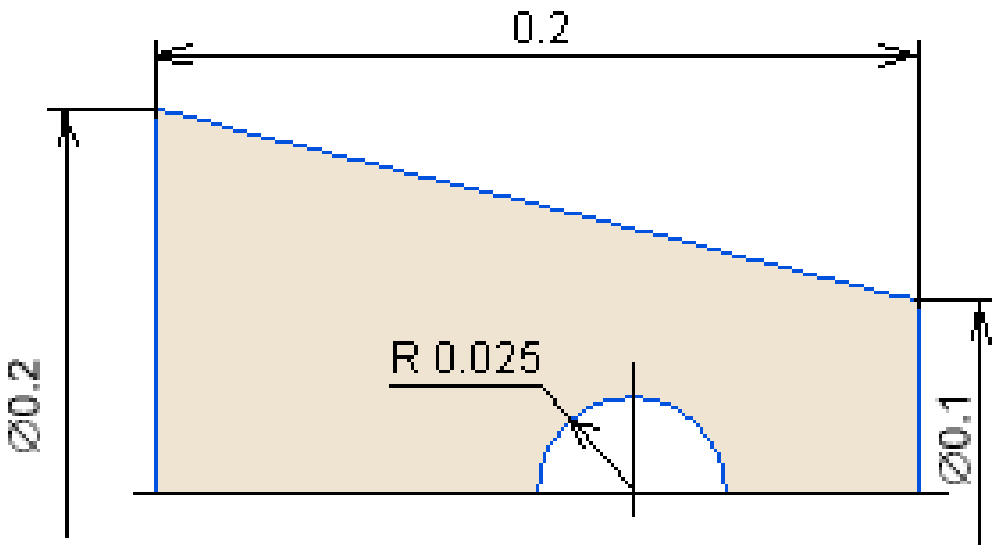


# QuickField simulation report

## Equilibrium temperature

Hot steel sphere is submerged into the cup of cold water.  
Calculate the equilibrium temperature.



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/heat\\_exchange.htm](https://quickfield.com/advanced/heat_exchange.htm)

# Problem info

Problem type: Transient Heat Transfer (integration time: 72000 s.)

Geometry model class: Axisymmetric

Problem database file names:

- Problem: *transient.pbm*
- Geometry: *Initial.mod*
- Material Data: *Transient.dht*
- Material Data 2 (library): *none*
- Electric circuit: *none*

Results taken from other problems:

- *Temperature Field: Initial.pbm*

# Geometry model

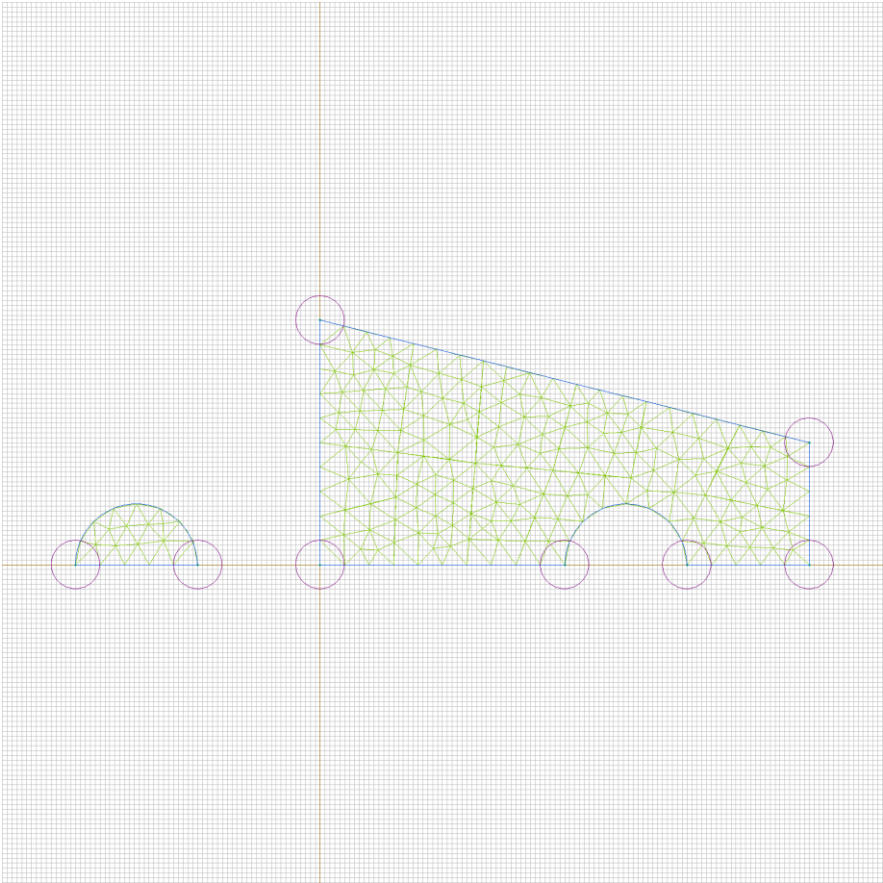


Table 1. Geometry model statistics

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

Number of nodes: 225.

# 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:

- [water](#)
- [steel](#)
- 

Edges:

- [convection](#)
- [initial T0](#)
- [initial T1](#)
- [boundary](#)
- 

Vertices:

Detailed information about each label is listed below.

Labelled objects: block "water"

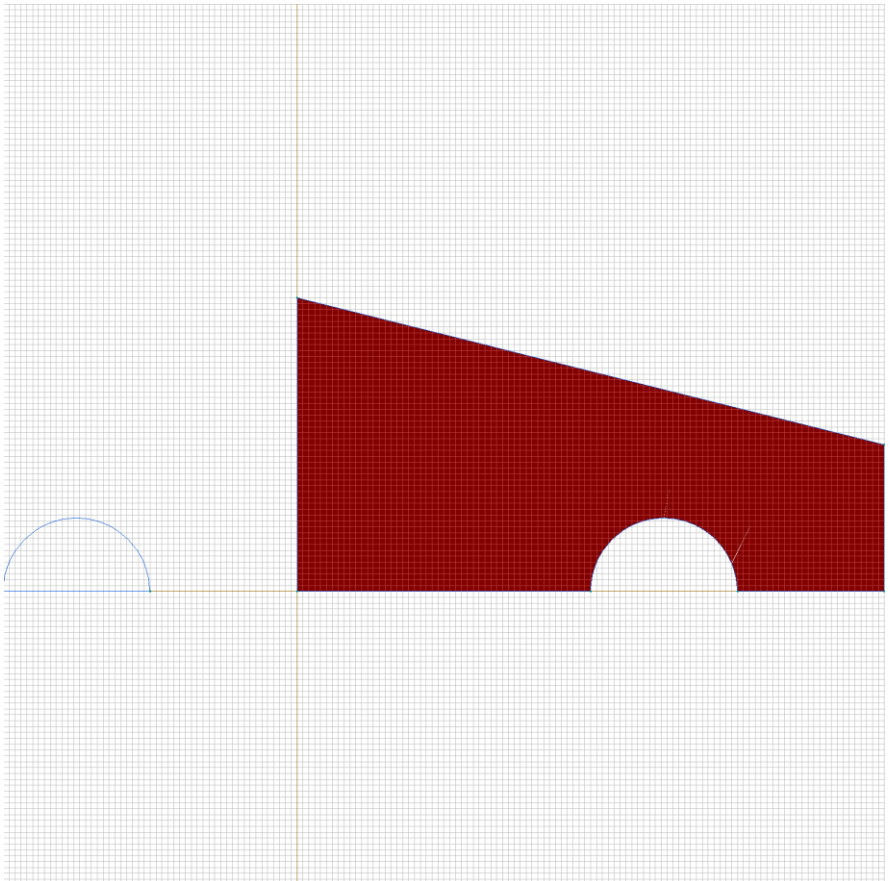
There are (1) objects with this label

Thermal conductivity:  $\lambda_x=0.6$  [W/(K\*m)],

$\lambda_y=0.6$  [W/(K\*m)]

Specific heat:  $C=4200$  [J/(kg\*K)]

Mass density:  $\rho=1000$  [kg/m<sup>3</sup>]



Labelled objects: block "steel"

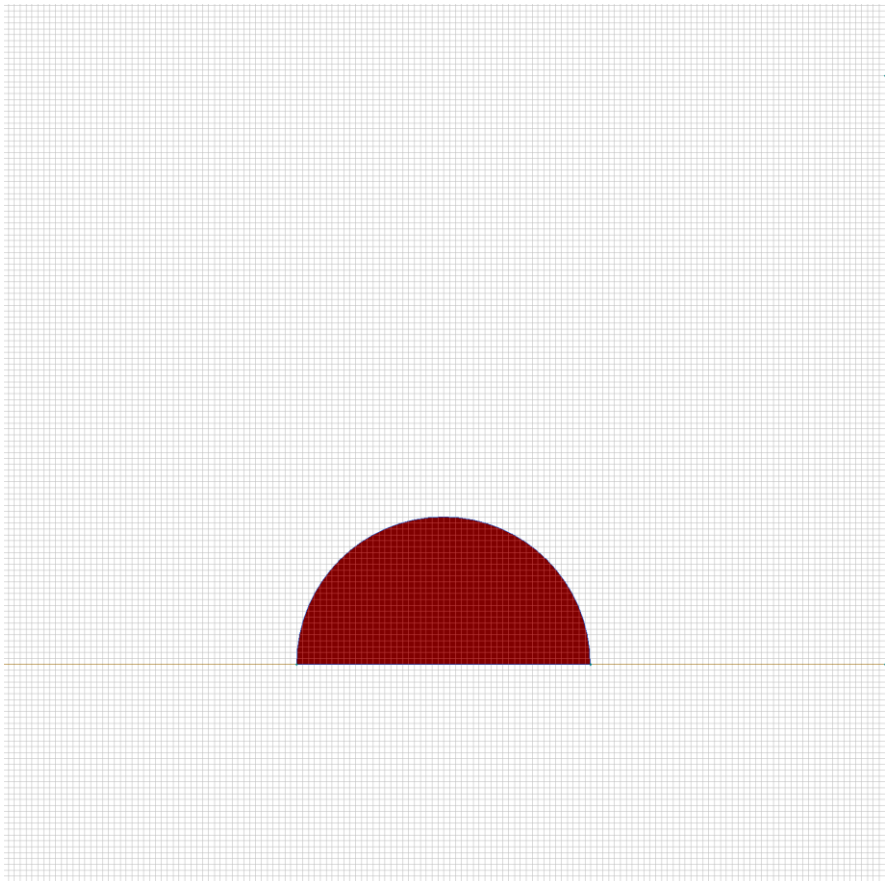
There are (1) objects with this label

Thermal conductivity:  $\lambda_x=40$  [W/(K\*m)],

$\lambda_y=40$  [W/(K\*m)]

Specific heat:  $C=460$  [J/(kg\*K)]

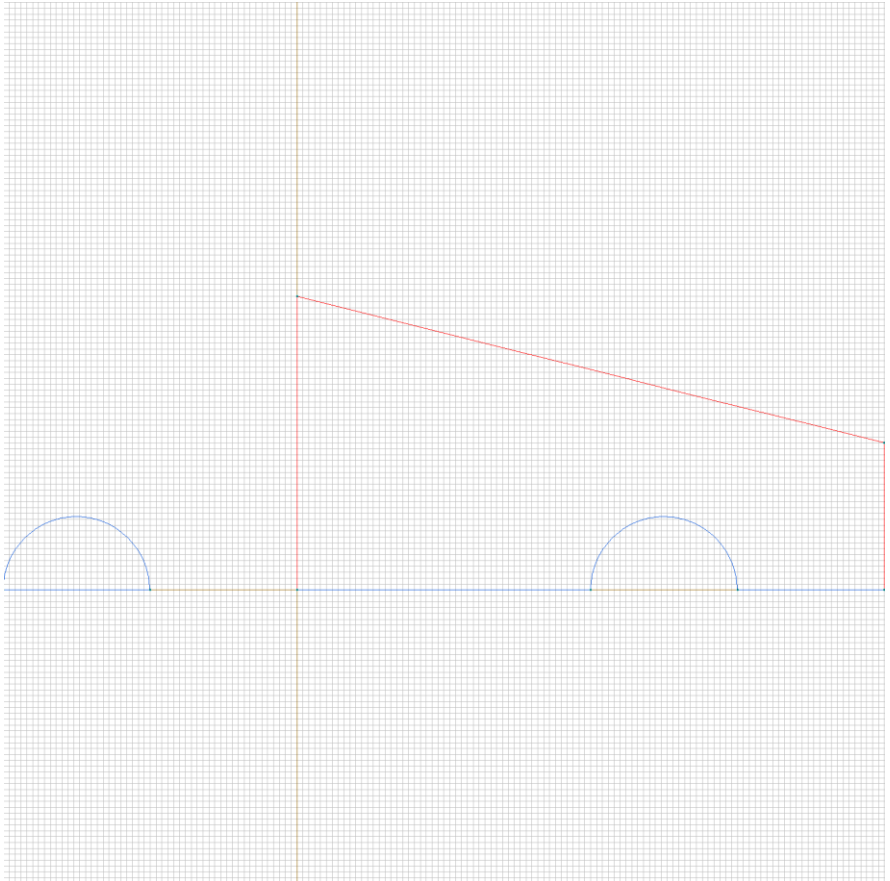
Mass density:  $\rho=7800$  [kg/m<sup>3</sup>]



## Labelled objects: edge "convection"

There are (3) objects with this label

Convection:  $\alpha=0.001$  [W/(K\*m<sup>2</sup>)], temperature  $T_0=-273.15$  [K]

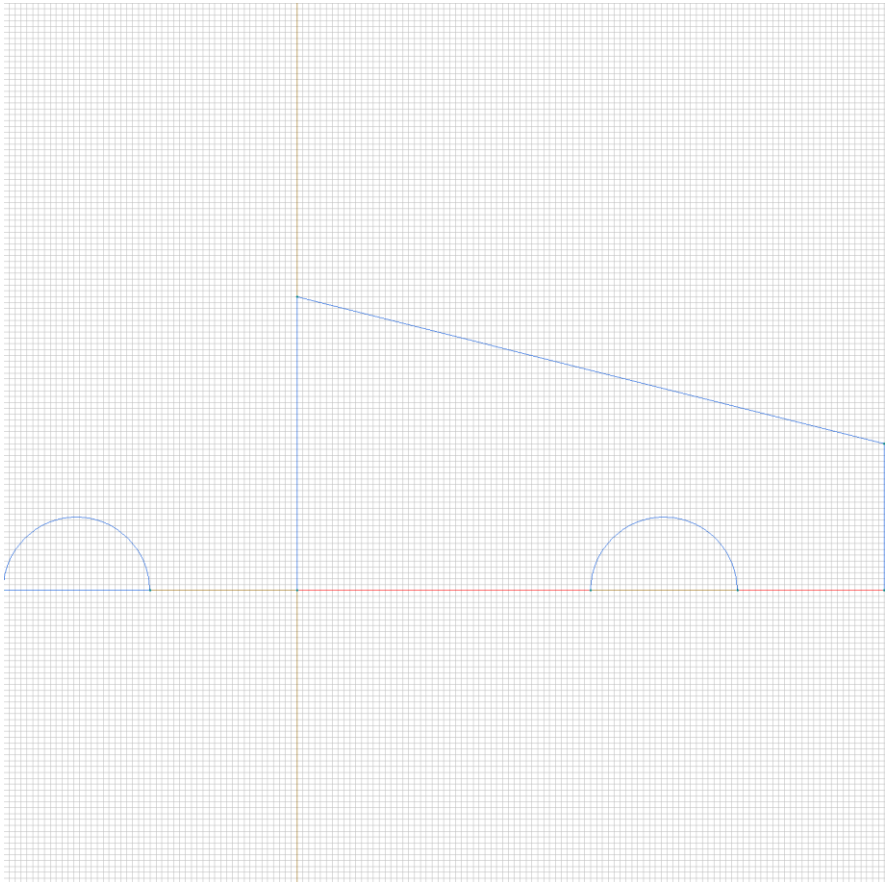




Labelled objects: edge "initial T0"

There are (2) objects with this label

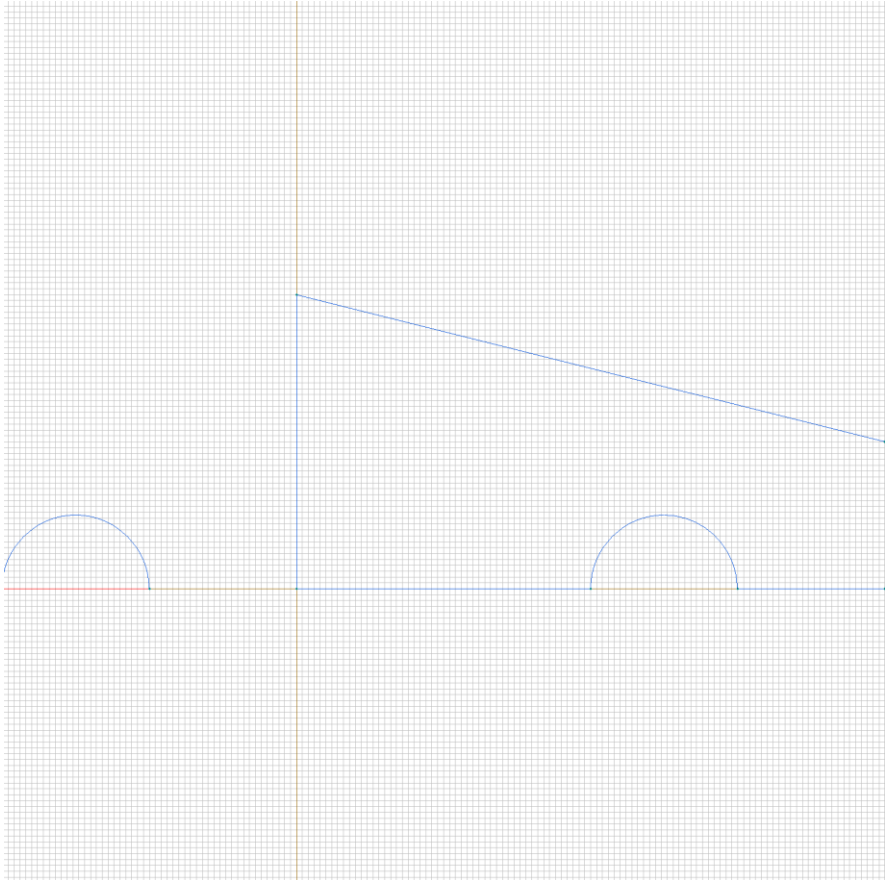
No material data (boundary conditions) are specified



Labelled objects: edge "initial T1"

There are (1) objects with this label

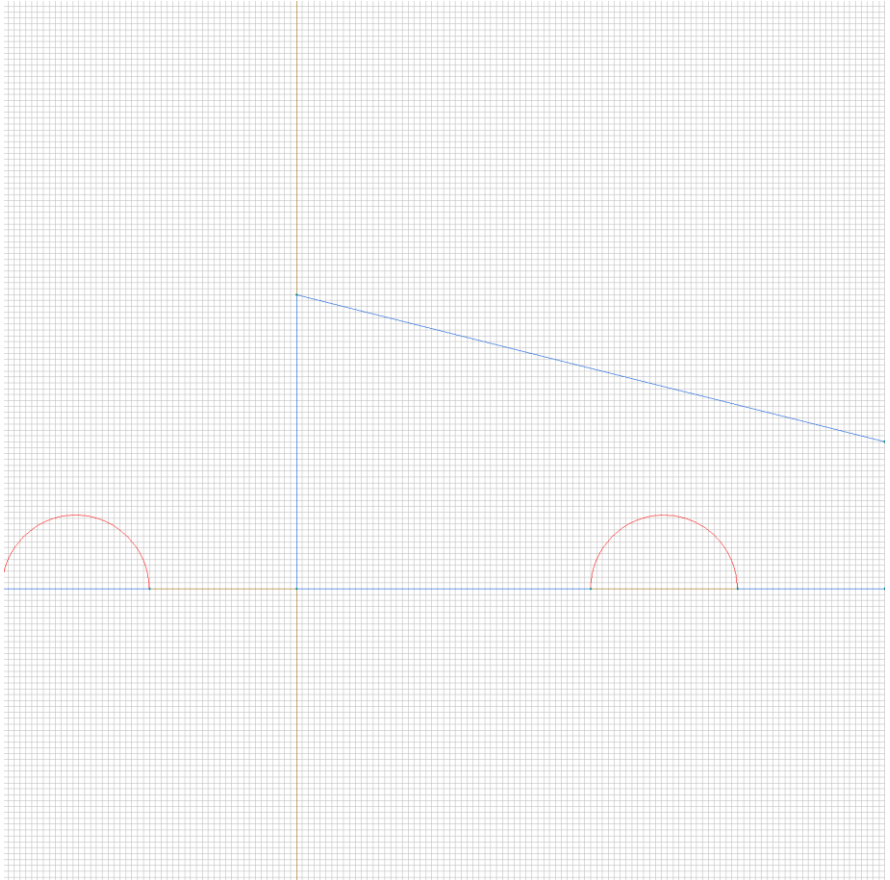
No material data (boundary conditions) are specified



Labelled objects: edge "boundary"

There are (2) objects with this label

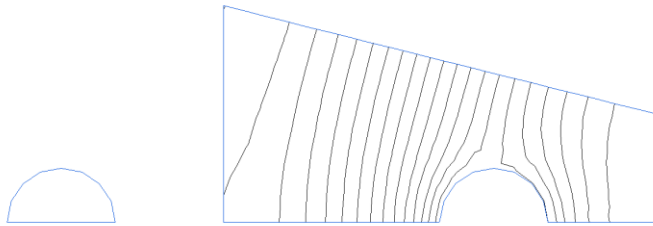
Even periodic:  $T1 = T2$





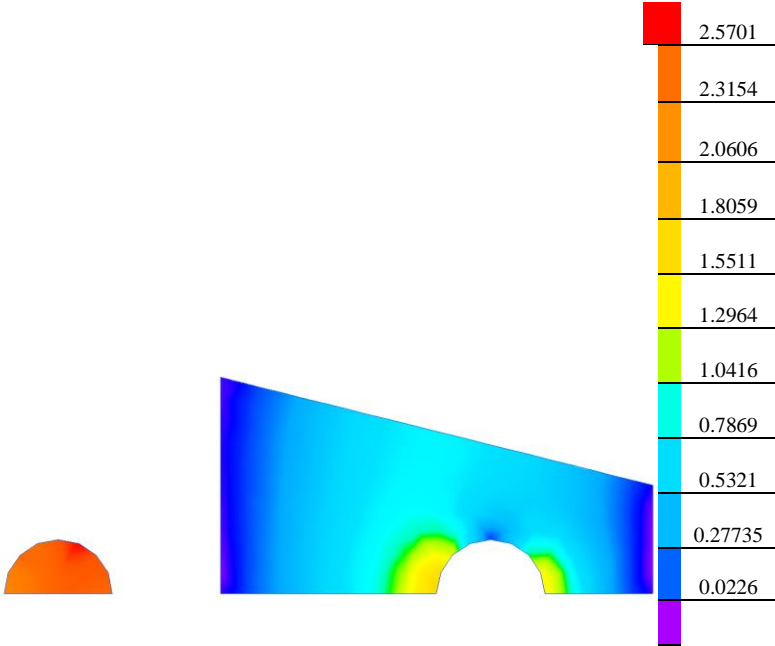
# Results

Field lines



# Results

Color map of Heat flux |F| [W/m<sup>2</sup>]



# Nonlinear dependencies

No non-linear dependencies are used in this problem data