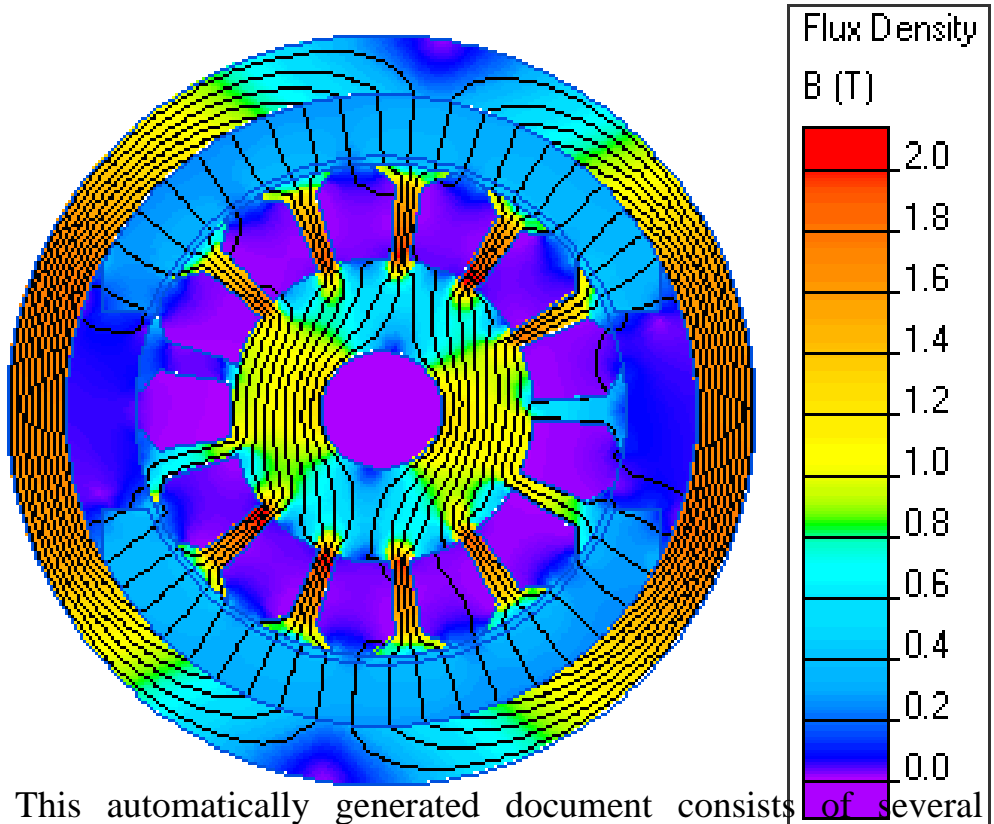


# QuickField simulation report

## DC motor simulation

Magnetic field distribution in a DC motor



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/dc\\_motor\\_simulation.htm](https://quickfield.com/advanced/dc_motor_simulation.htm)

# Problem info

Problem type: Magnetostatics

Geometry model class: Plane-Parallel

Problem database file names:

- Problem: *Motor-j1.pbm*
- Geometry: *Motor-j1.mod*
- Material Data: *Motor-j1.dms*
- Material Data 2 (library): *none*
- Electric circuit: *none*

Results taken from other problems:

- *none*

# Geometry model

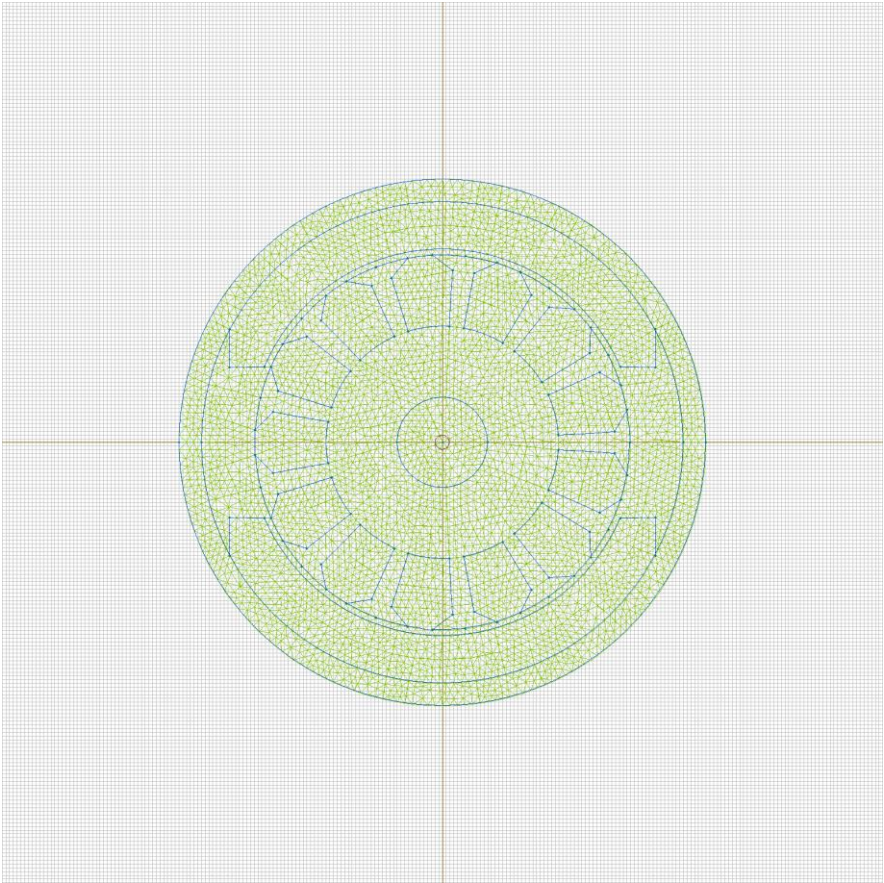


Table 1. Geometry model statistics

	With Label	Total
Blocks	8	19
Edges	1	124
Vertices	0	110

Number of nodes: 4283.

# 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:

- [st3](#)
- [coil1](#)
- [ep20](#)
- [ferrite-top](#)
- [coil2](#)
- [ferrite-bot](#)
- [coil](#)
- [air](#)
- 

Edges:

- [A = 0](#)
- 

Vertices:

Detailed information about each label is listed below.

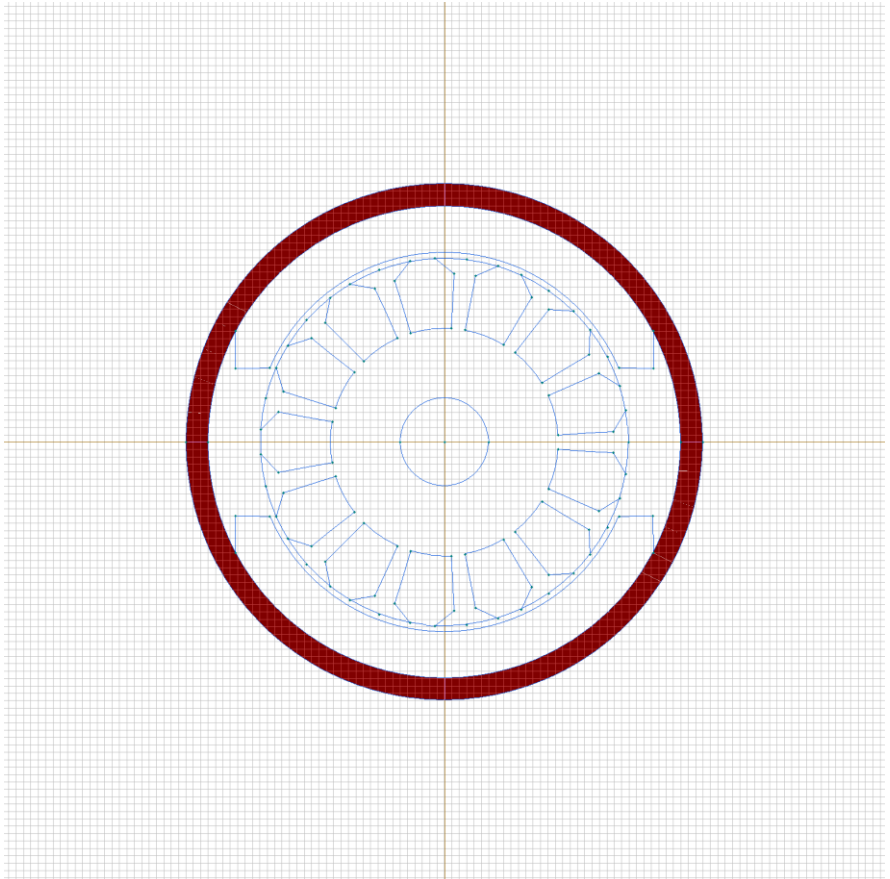
Labelled objects: block "st3"

There are (1) objects with this label

Relative magnetic permeability:  $\mu$ =nonlinear (see Table 2 in the "Nonlinear dependencies" section)

Current density:  $j=0$  [A/m<sup>2</sup>]

Conductor's connection: in parallel



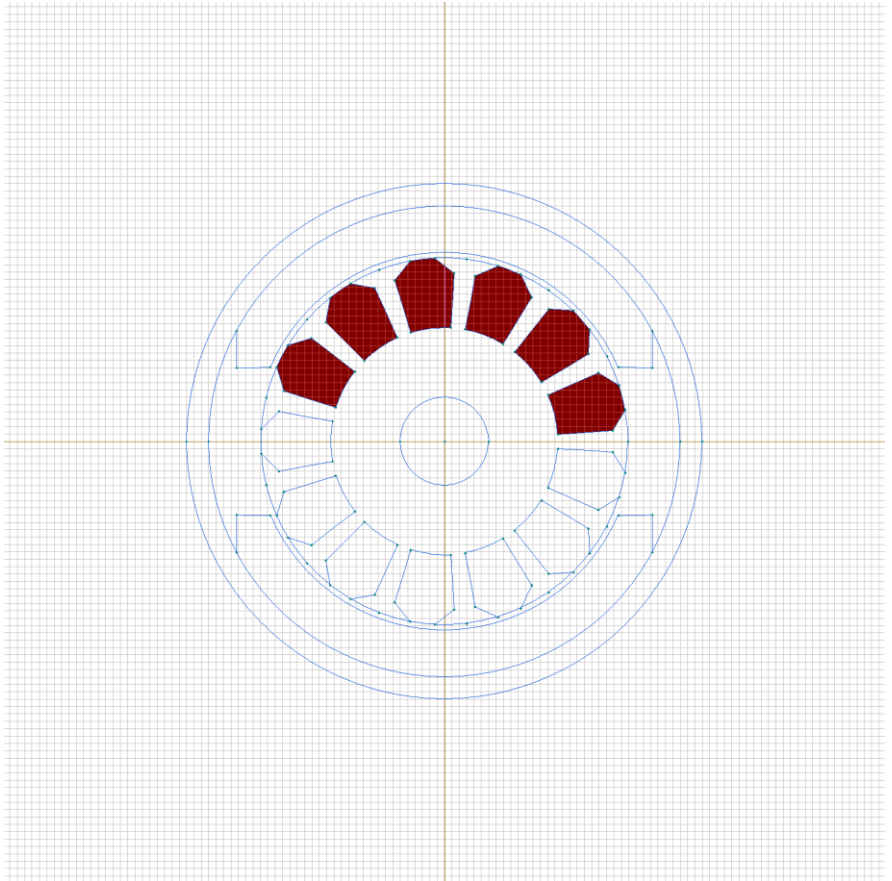
Labelled objects: block "coil1"

There are (6) objects with this label

Relative magnetic permeability:  $\mu_x=1$ ,  $\mu_y=1$

Current density:  $j=1000000$  [A/m<sup>2</sup>]

Conductor's connection: in parallel



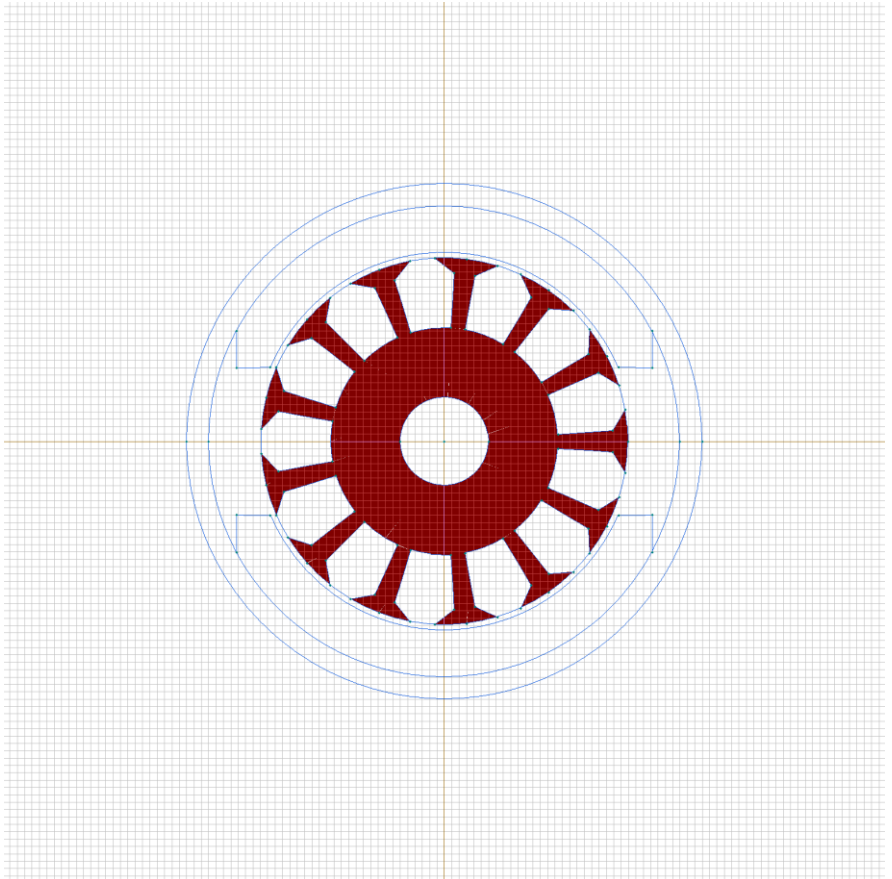
Labelled objects: block "ep20"

There are (1) objects with this label

Relative magnetic permeability:  $\mu$ =nonlinear (see Table 3 in the "Nonlinear dependencies" section)

Current density:  $j=0$  [A/m<sup>2</sup>]

Conductor's connection: in parallel





## Labelled objects: block "ferrite-top"

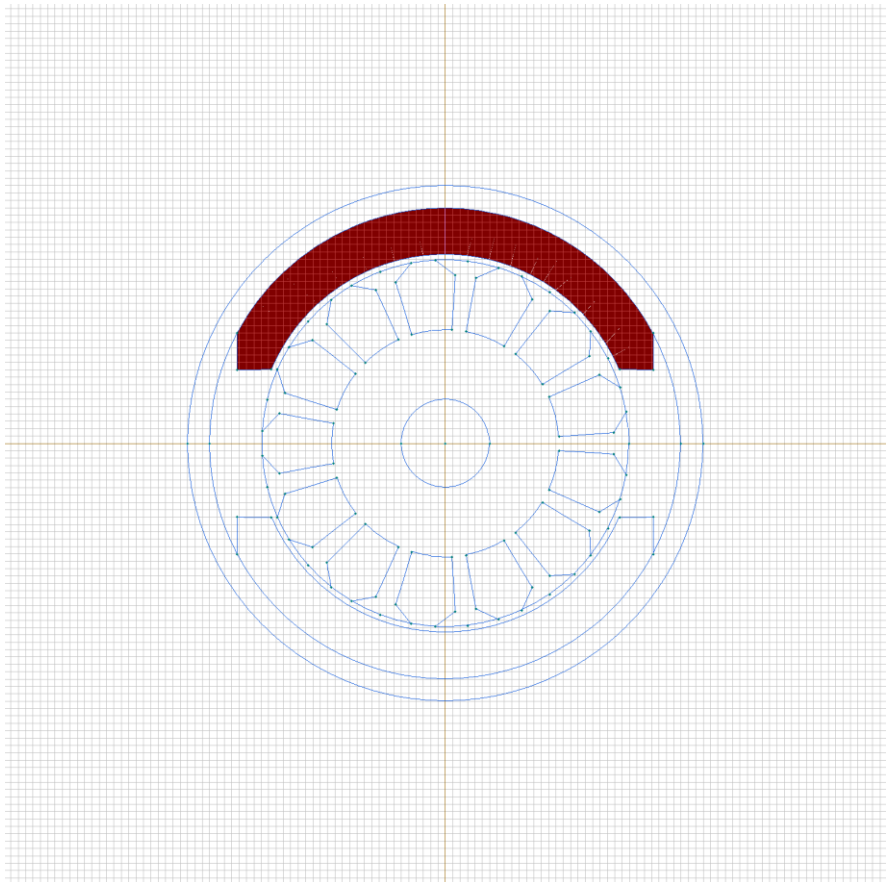
There are (1) objects with this label

Relative magnetic permeability:  $\mu$ =nonlinear (see Table 4 in the "Nonlinear dependencies" section)

Coercive force:  $H_c=242000$  [A], direction: 0 [deg]

Current density:  $j=0$  [A/m<sup>2</sup>]

Conductor's connection: in parallel



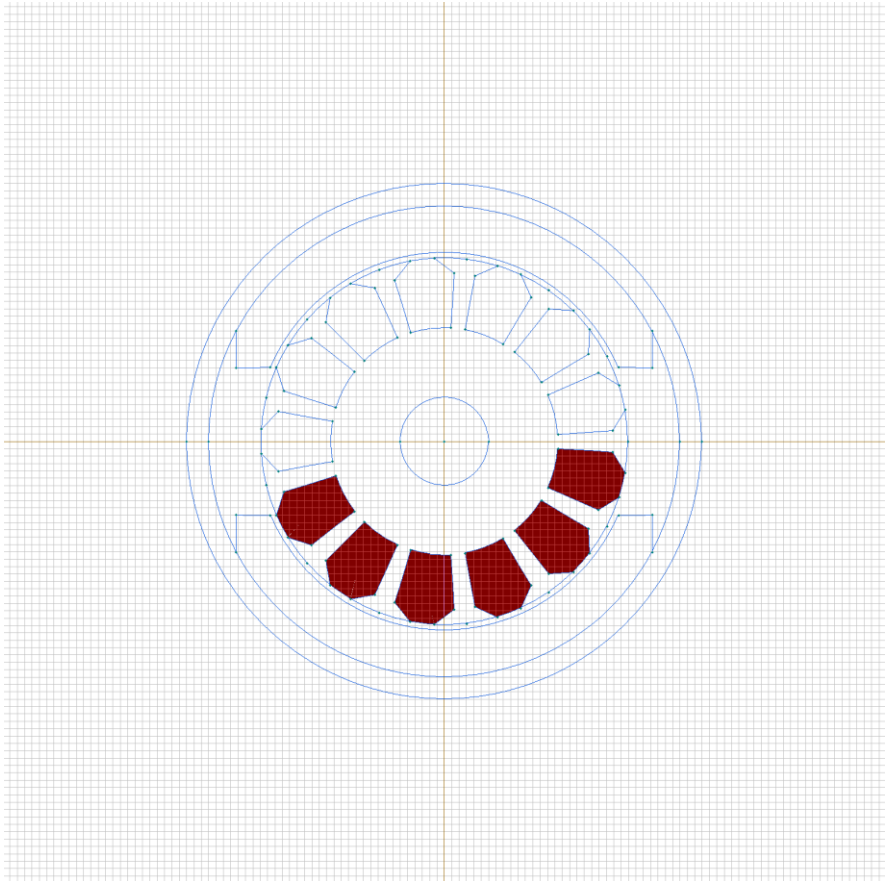
Labelled objects: block "coil2"

There are (6) objects with this label

Relative magnetic permeability:  $\mu_x=1$ ,  $\mu_y=1$

Current density:  $j=-1000000$  [A/m<sup>2</sup>]

Conductor's connection: in parallel



## Labelled objects: block "ferrite-bot"

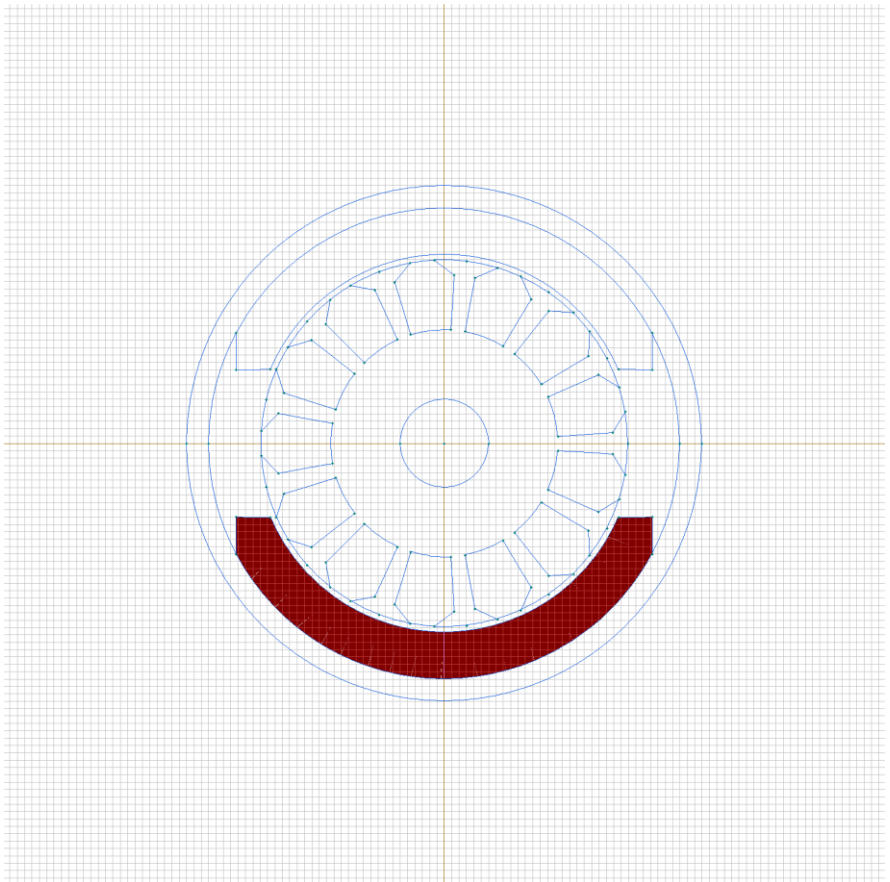
There are (1) objects with this label

Relative magnetic permeability:  $\mu$ =nonlinear (see Table 5 in the "Nonlinear dependencies" section)

Coercive force:  $H_c=242000$  [A], direction: 180 [deg]

Current density:  $j=0$  [A/m<sup>2</sup>]

Conductor's connection: in parallel



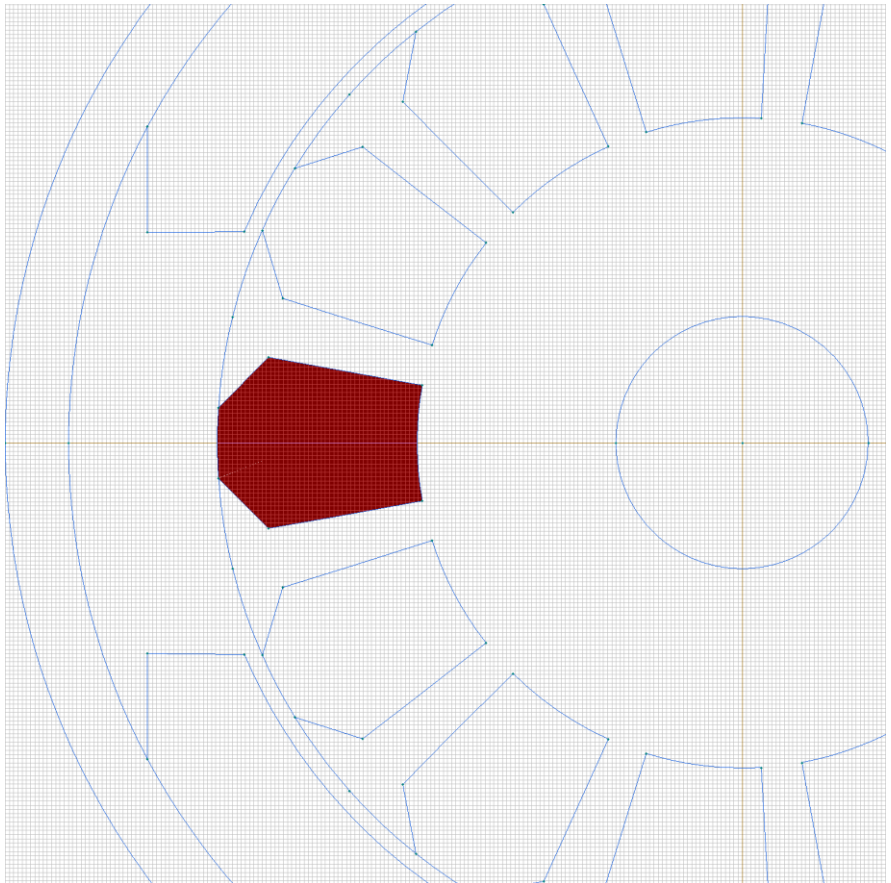
## Labelled objects: block "coil"

There are (1) objects with this label

Relative magnetic permeability:  $\mu_x=1$ ,  $\mu_y=1$

Current density:  $j=0$  [A/m<sup>2</sup>]

Conductor's connection: in parallel



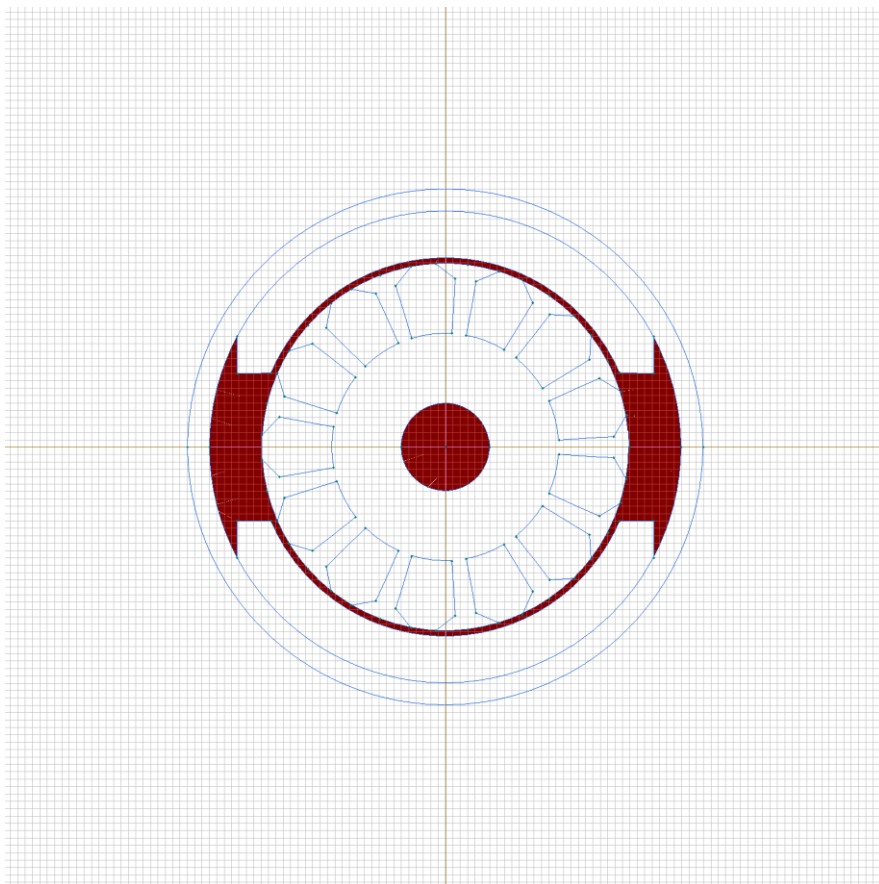
Labelled objects: block "air"

There are (2) objects with this label

Relative magnetic permeability:  $\mu_x=1$ ,  $\mu_y=1$

Current density:  $j=0$  [A/m<sup>2</sup>]

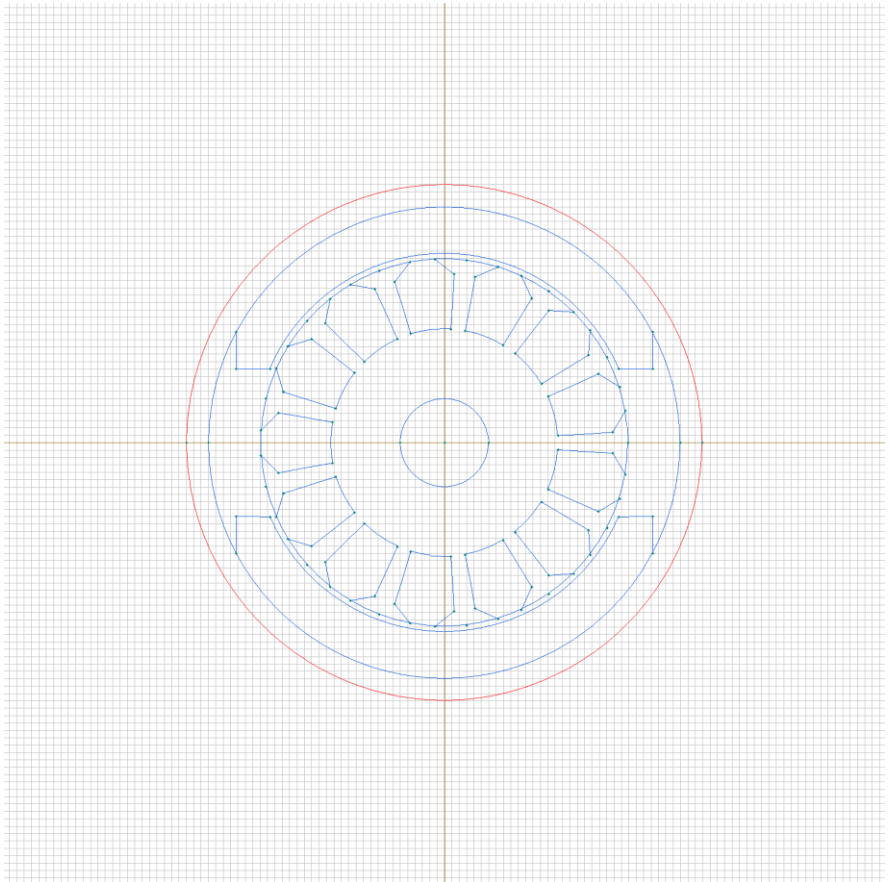
Conductor's connection: in parallel



Labelled objects: edge "A = 0"

There are (2) objects with this label

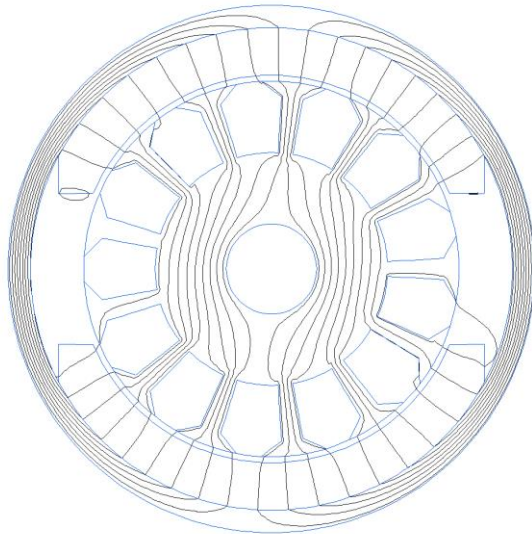
Magnetic potential:  $A=0$  [Wb/m]





# Results

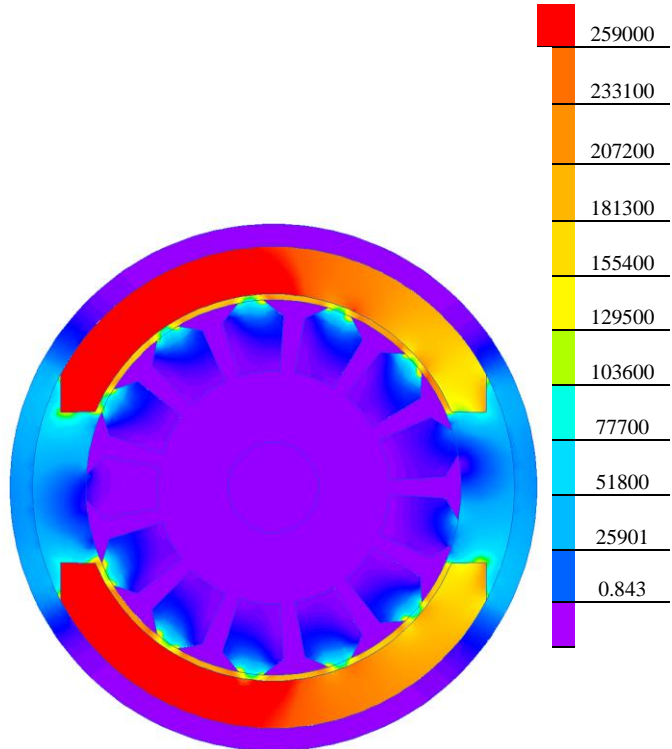
Field lines





# Results

Color map of Strength  $|H|$  [A/m]



# Nonlinear dependencies

**Table 2. BH-curve**

B [T]	H [A/m]
0	0
0.1	100
0.2	140
0.3	180
0.4	210
0.5	250
0.6	295
0.7	345
0.8	405
0.9	480
1	570
1.1	690
1.2	845
1.3	1080
1.4	1490
1.5	2270
1.6	4000
1.7	7050
1.8	11900
1.9	18800
2	29000

**Table 3. BH-curve**

B [T]	H [A/m]
0	0

0.2	50
0.6	100
1.05	200
1.25	300
1.4	500
1.52	1000
1.61	2000
1.66	3000
1.73	5000
1.85	10000
2	20000
2.1	30000

**Table 4. BH-curve**

B [T]	H [A/m]
0	-242000
0.03	-240000
0.055	-230000
0.39	0

**Table 5. BH-curve**

B [T]	H [A/m]
0	-242000
0.03	-240000
0.055	-230000
0.39	0

