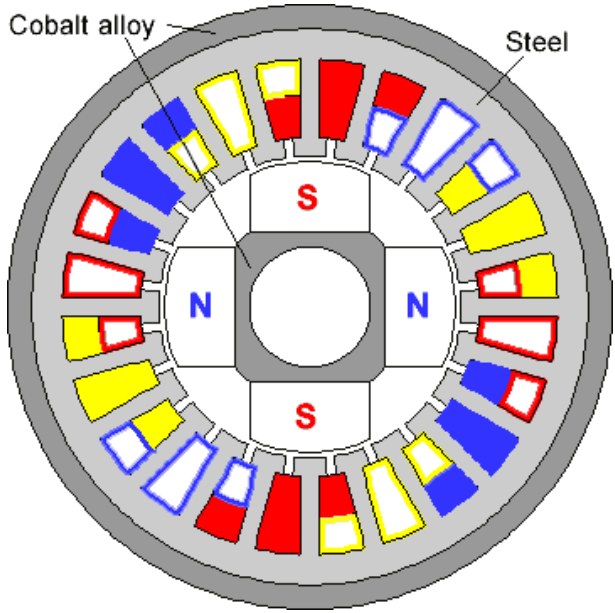
QuickField simulation report

Electric motor

Calculation of the magnetic field of the electric 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/magn4.htm

Problem info

Problem type: Magnetostatics
Geometry model class: Plane-Parallel
Problem database file names:

- Problem: *Magn4.pbm*
- Geometry: *Magn4.mod*
- Material Data: *Magn4.dms*
- Material Data 2 (library): *none*
- Electric circuit: *none*

Results taken from other problems:

- *none*

Geometry model

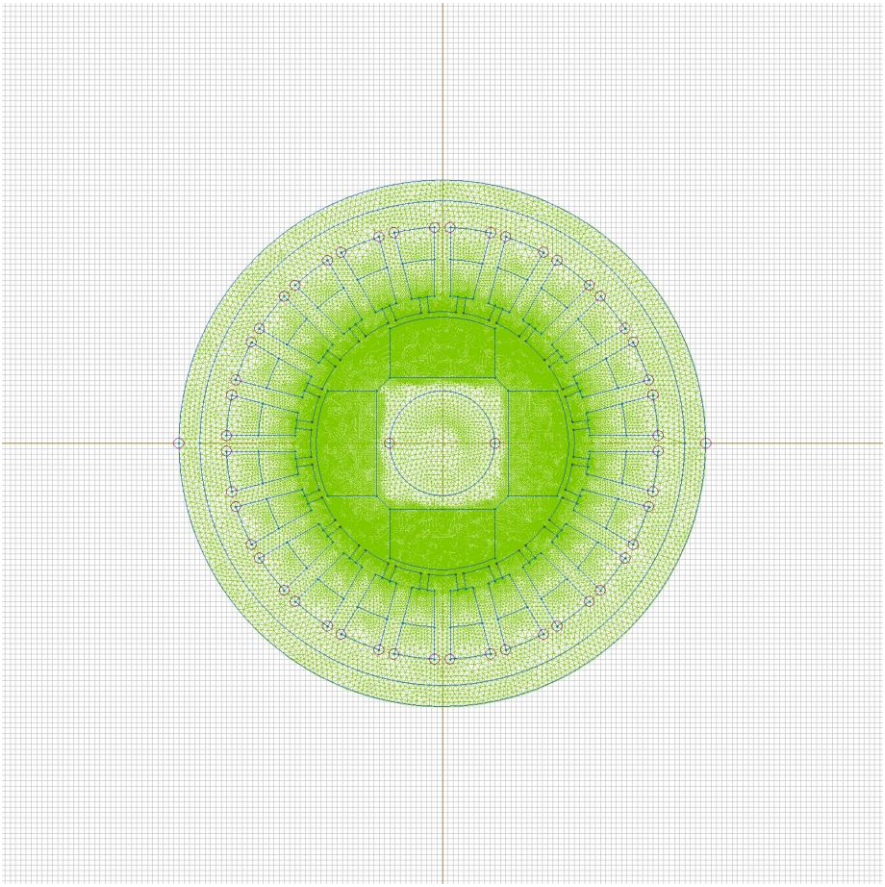


Table 1. Geometry model statistics

	With Label	Total
Blocks	10	57
Edges	3	314
Vertices	0	262

Number of nodes: 56471.

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)

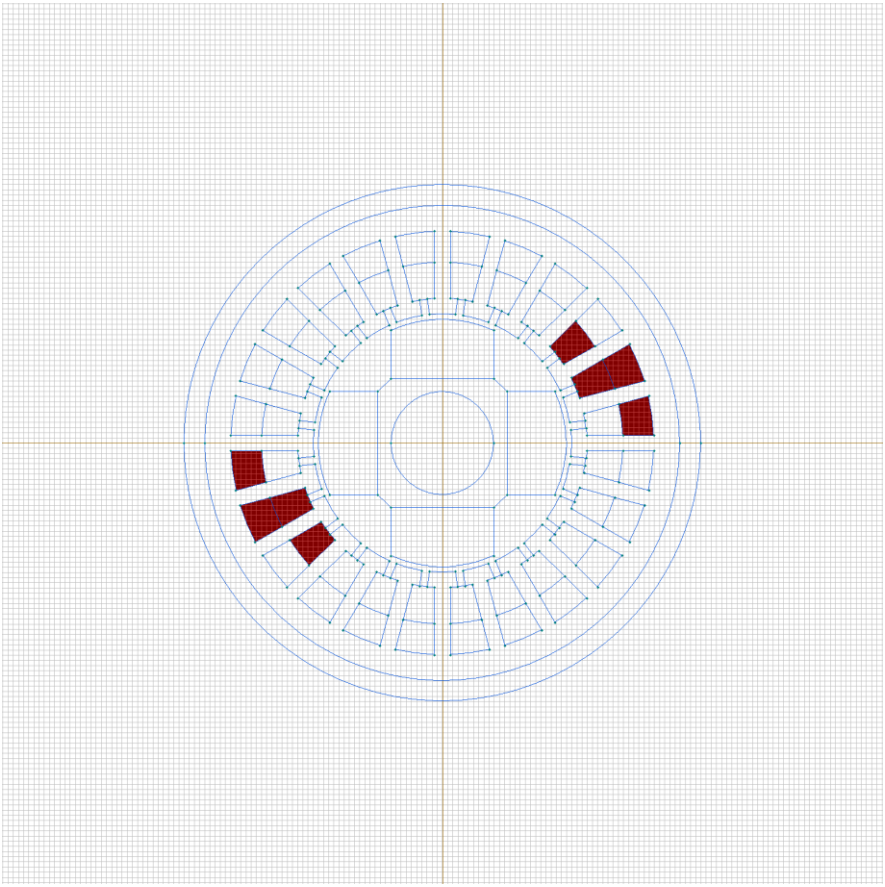
Blocks:	Edges:	Vertices:
• Coil S+ • Coil R- • Air • Magnet • Cobalt Alloy • Coil T- • Coil T+ • Coil R+ • Coil S- • Steel •	• Magnet Right • Magnet Left • A = 0 •	

Detailed information about each label is listed below.

Labelled objects: block "Coil S+"

There are (8) objects with this label

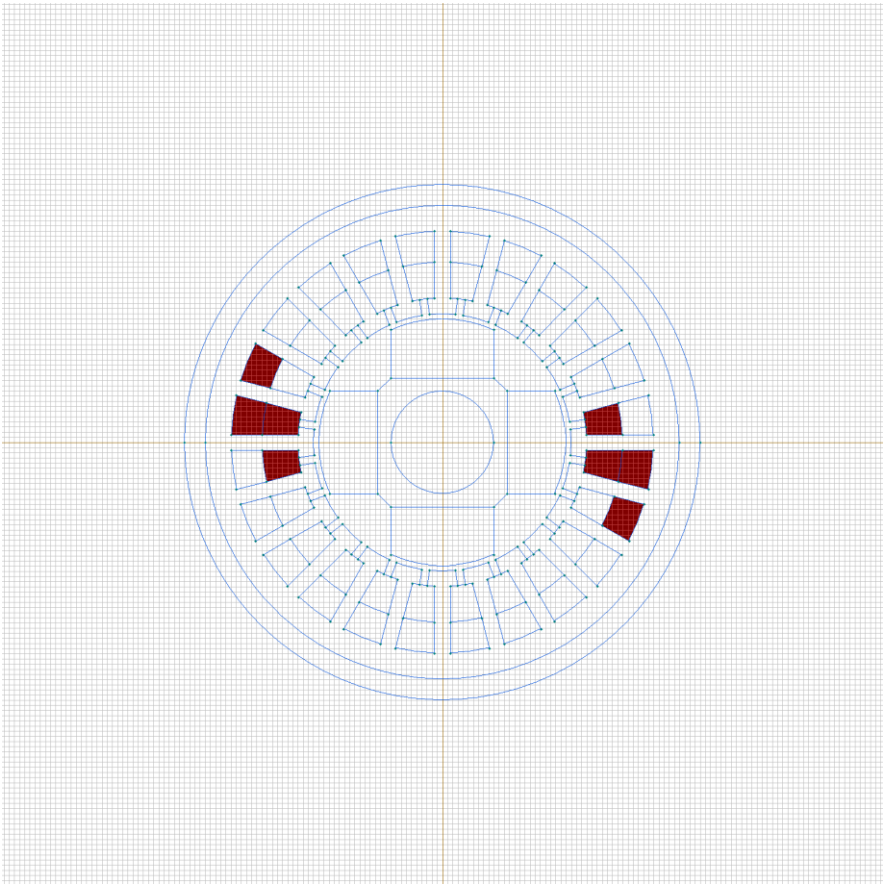
Relative magnetic permeability: mu_x=1, mu_y=1
Current density: j=-1300000 [A/m2]
Conductor's connection: in parallel



Labelled objects: block "Coil R-"

There are (8) objects with this label

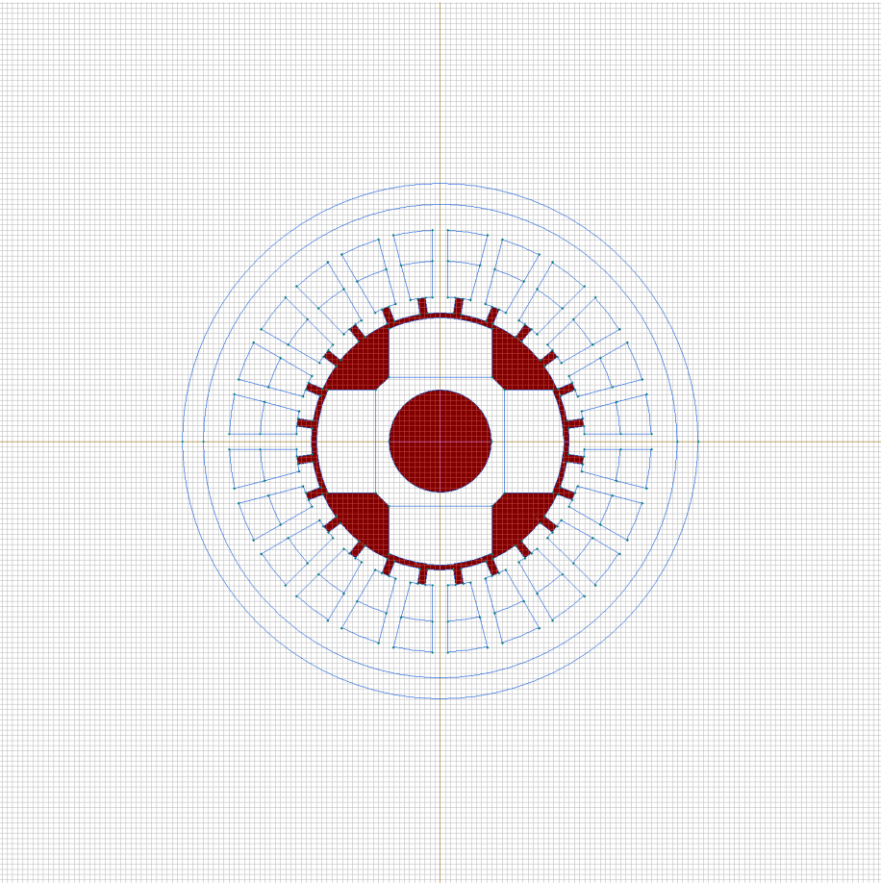
Relative magnetic permeability: mu_x=1, mu_y=1
Current density: j=-1300000 [A/m2]
Conductor's connection: in parallel



Labelled objects: block "Air"

There are (2) objects with this label

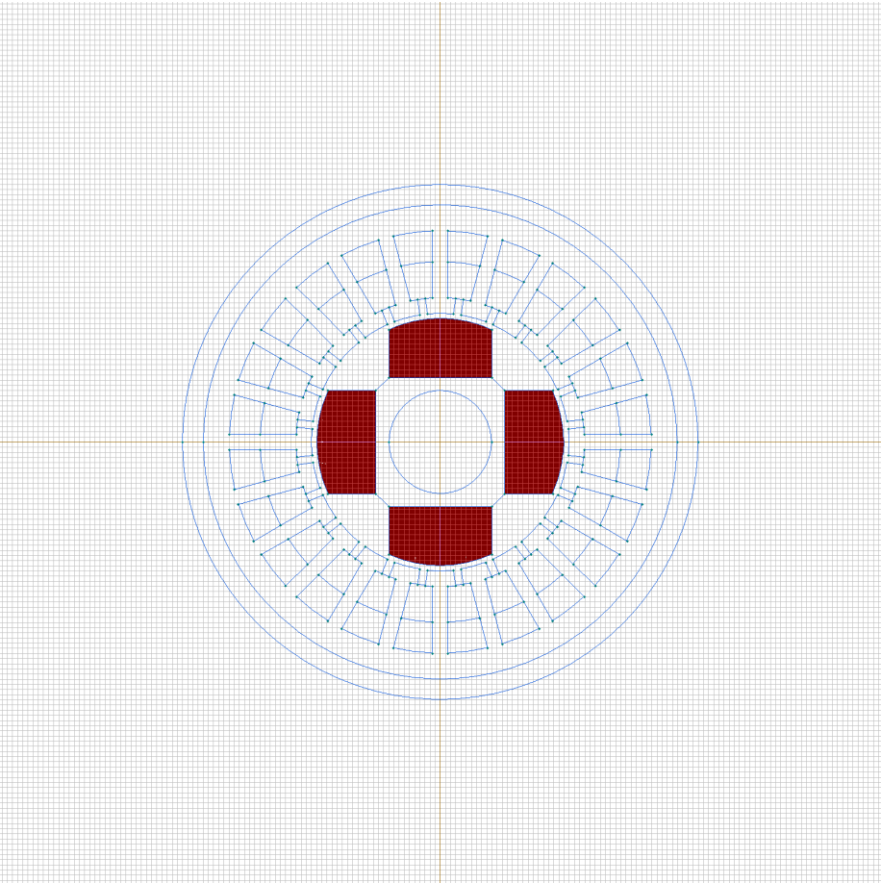
Relative magnetic permeability: mu_x=1, mu_y=1
Current density: j=0 [A/m2]
Conductor's connection: in parallel



Labelled objects: block "Magnet"

There are (4) objects with this label

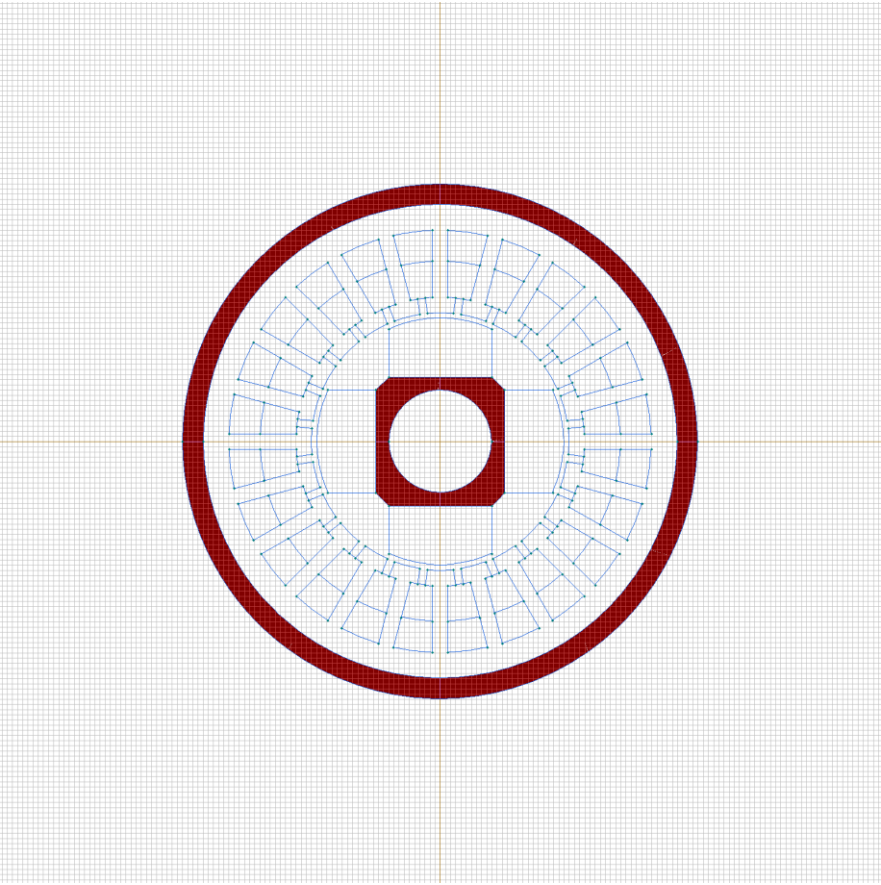
Relative magnetic permeability: mu_x=1.154, mu_y=1.154
Current density: j=0 [A/m2]
Conductor's connection: in parallel



Labelled objects: block "Cobalt Alloy"

There are (2) objects with this label

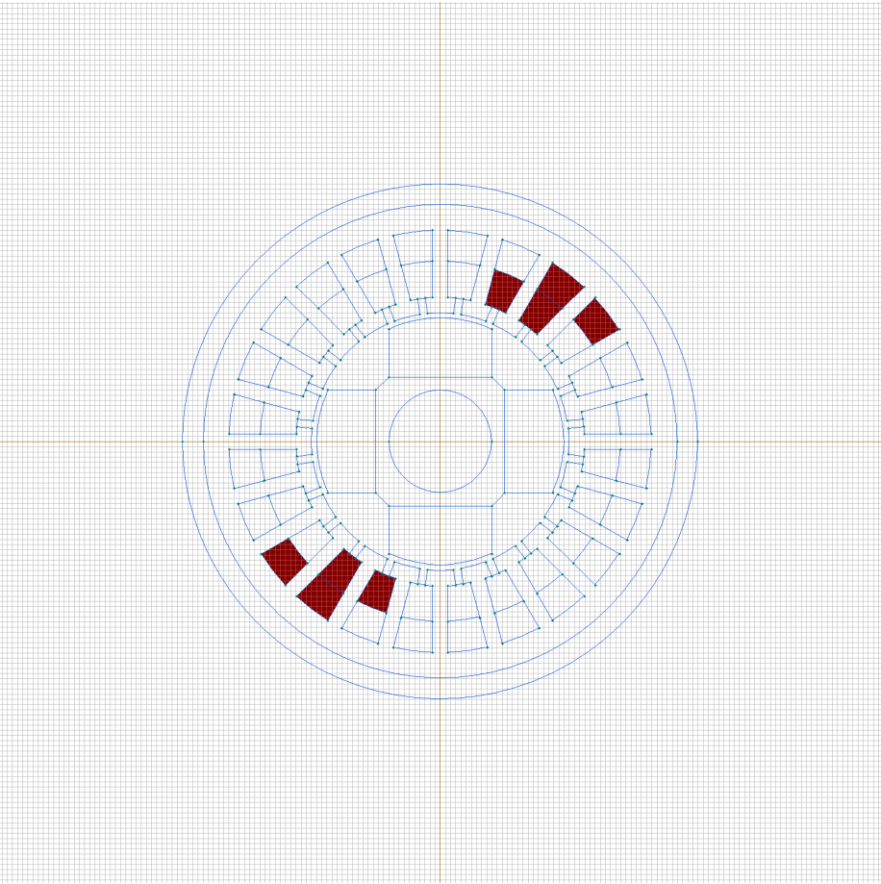
Relative magnetic permeability: mu=nonlinear (see Table 2 in the "Nonlinear dependencies" section)
Current density: j=0 [A/m2]
Conductor's connection: in parallel



Labelled objects: block "Coil T-"

There are (8) objects with this label

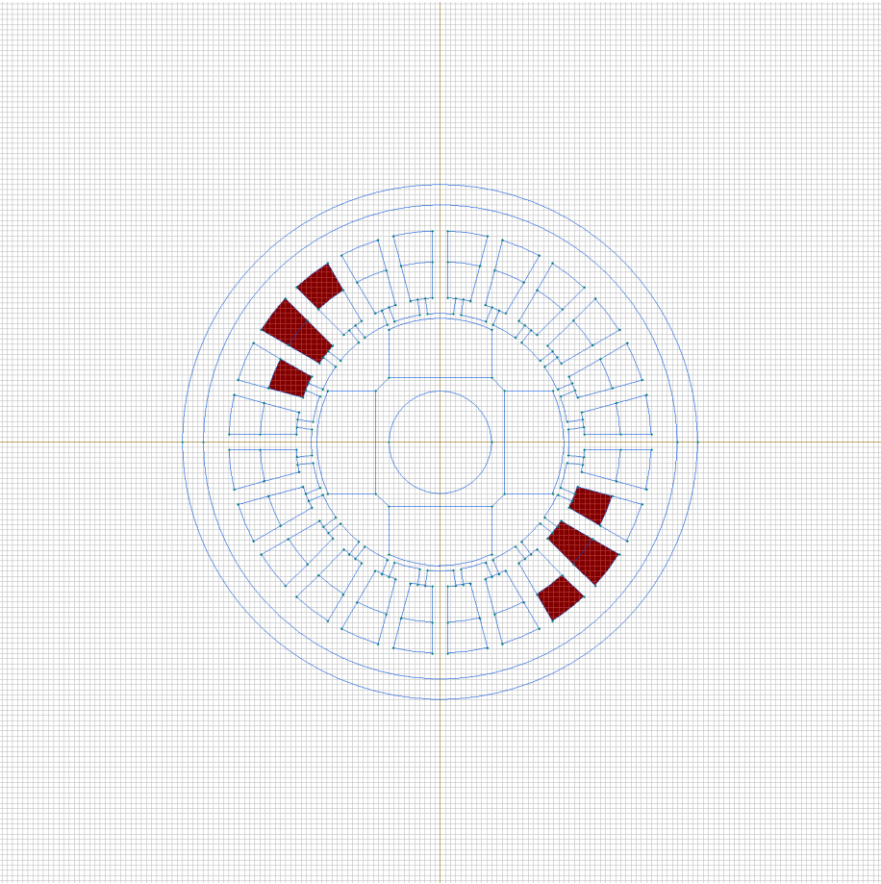
Relative magnetic permeability: mu_x=1, mu_y=1
Current density: j=0 [A/m2]
Conductor's connection: in parallel



Labelled objects: block "Coil T+"

There are (8) objects with this label

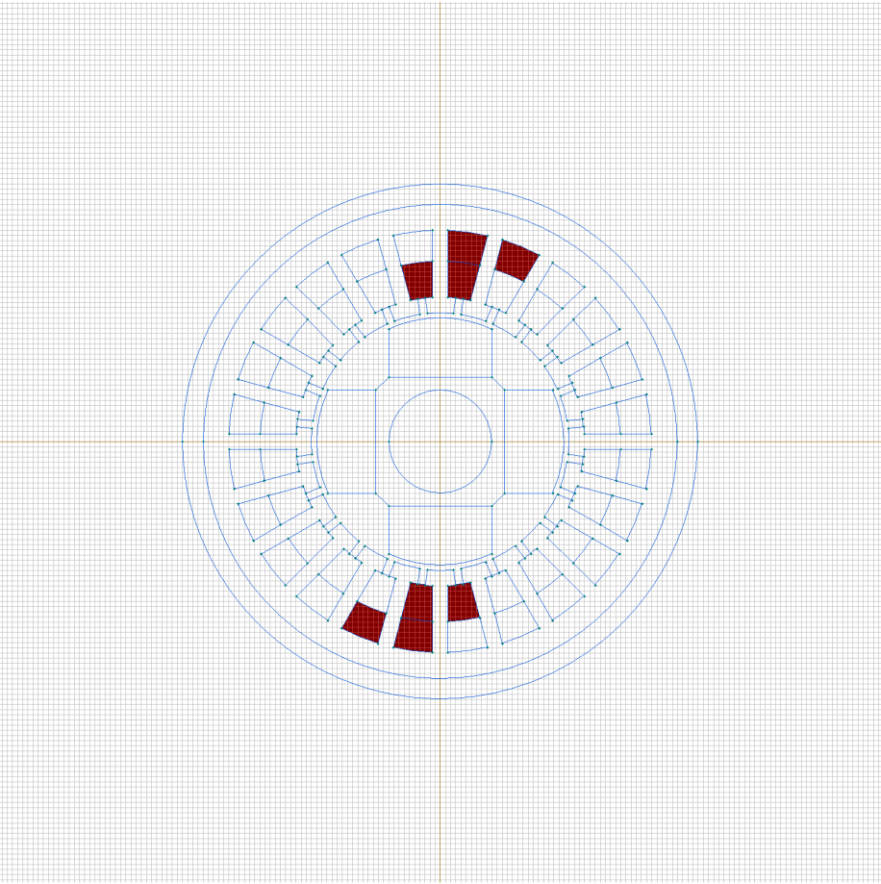
Relative magnetic permeability: mu_x=1, mu_y=1
Current density: j=0 [A/m2]
Conductor's connection: in parallel



Labelled objects: block "Coil R+"

There are (8) objects with this label

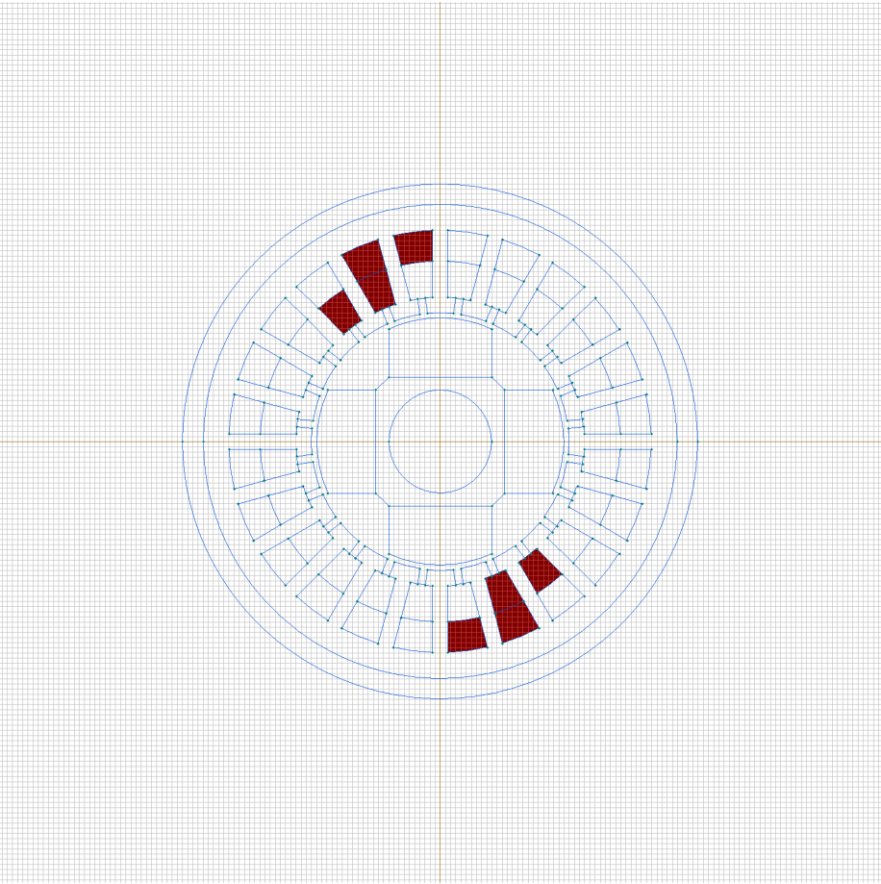
Relative magnetic permeability: mu_x=1, mu_y=1
Current density: j=1300000 [A/m2]
Conductor's connection: in parallel



Labelled objects: block "Coil S-"

There are (8) objects with this label

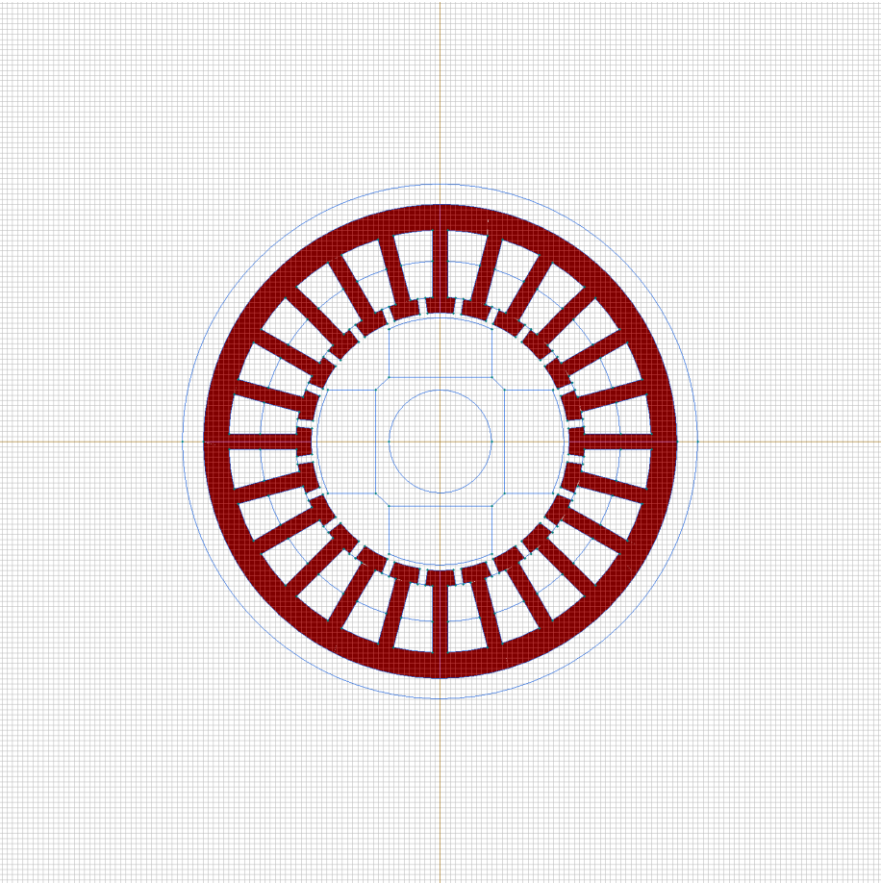
Relative magnetic permeability: mu_x=1, mu_y=1
Current density: j=1300000 [A/m2]
Conductor's connection: in parallel



Labelled objects: block "Steel"

There are (1) objects with this label

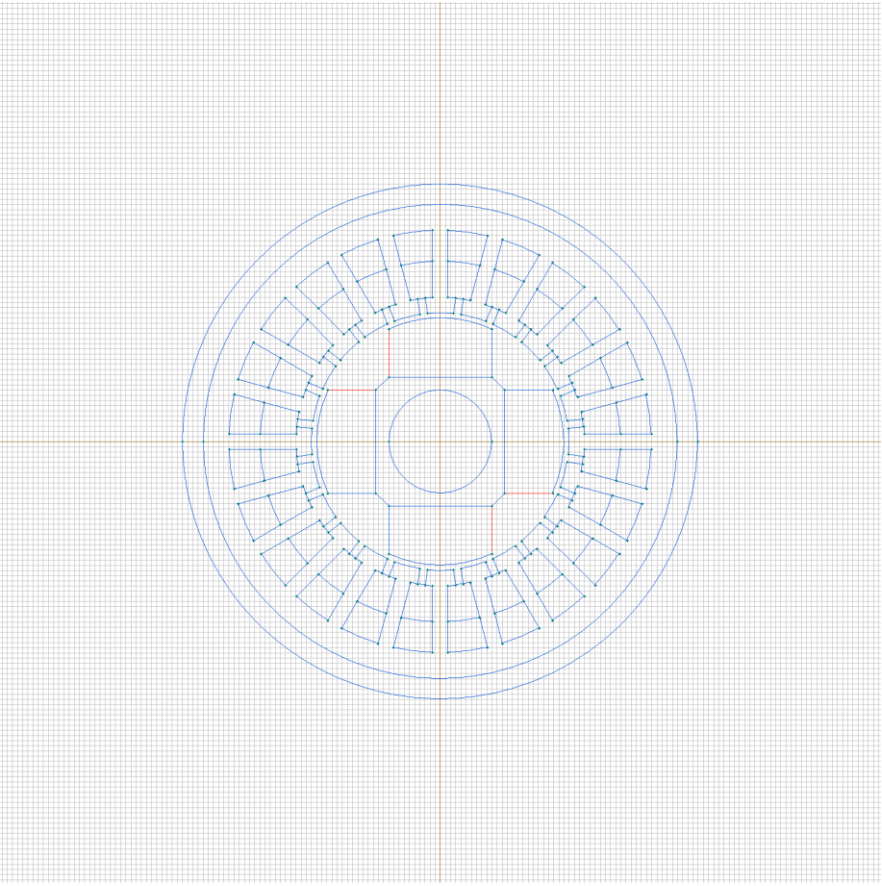
Relative magnetic permeability: mu=nonlinear (see Table 3 in the "Nonlinear dependencies" section)
Current density: j=0 [A/m2]
Conductor's connection: in parallel



Labelled objects: edge "Magnet Right"

There are (4) objects with this label

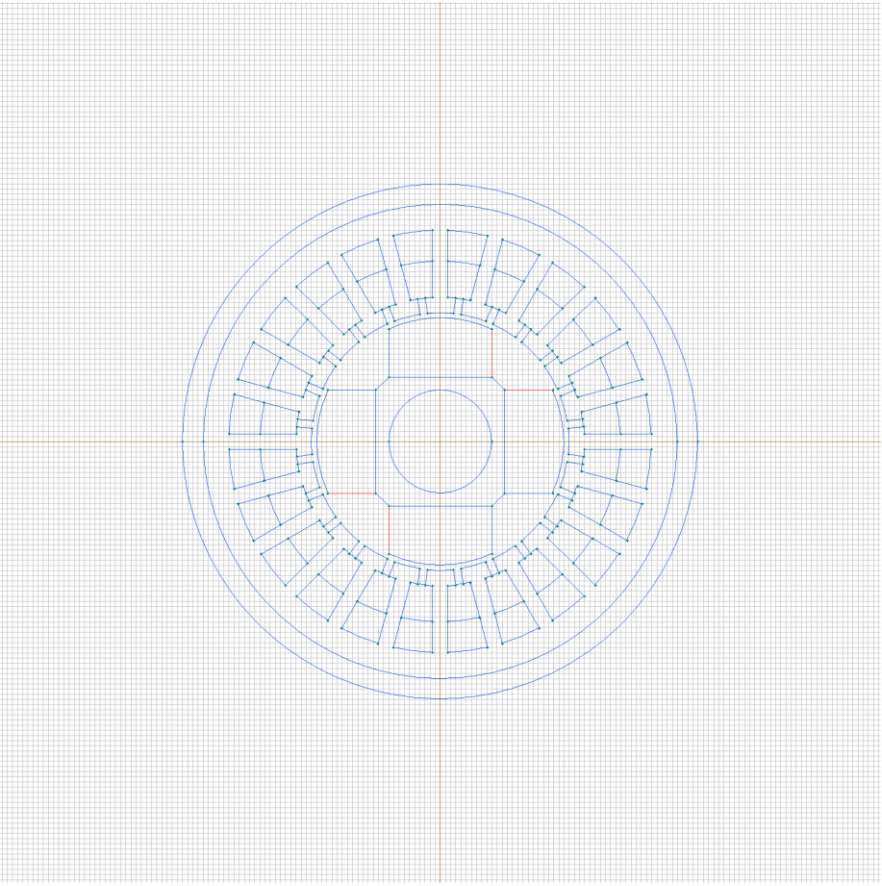
Tangential field: H_t=-550000 [A/m]



Labelled objects: edge "Magnet Left"

There are (4) objects with this label

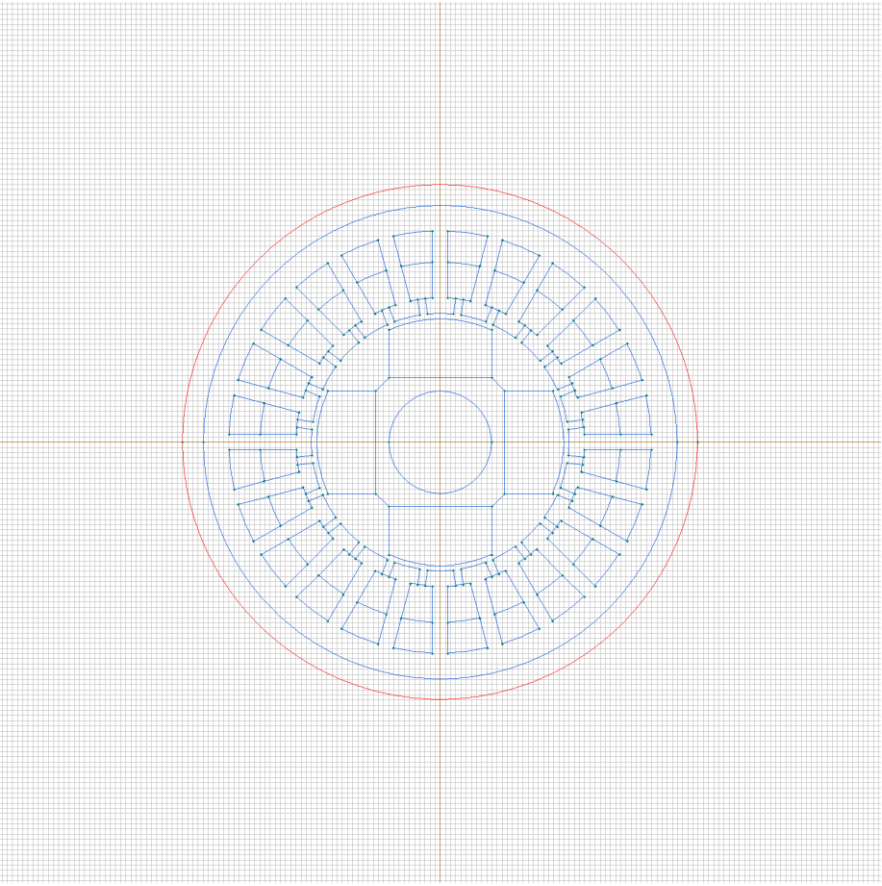
Tangential field: H_t=550000 [A/m]



Labelled objects: edge "A = 0"

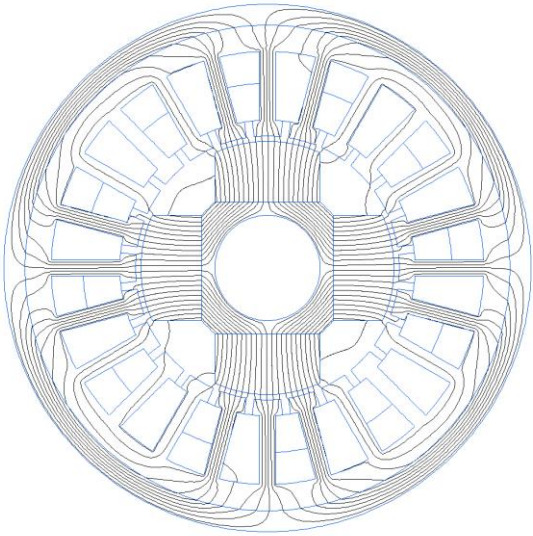
There are (2) objects with this label

Magnetic potential: A=0 [Wb/m]



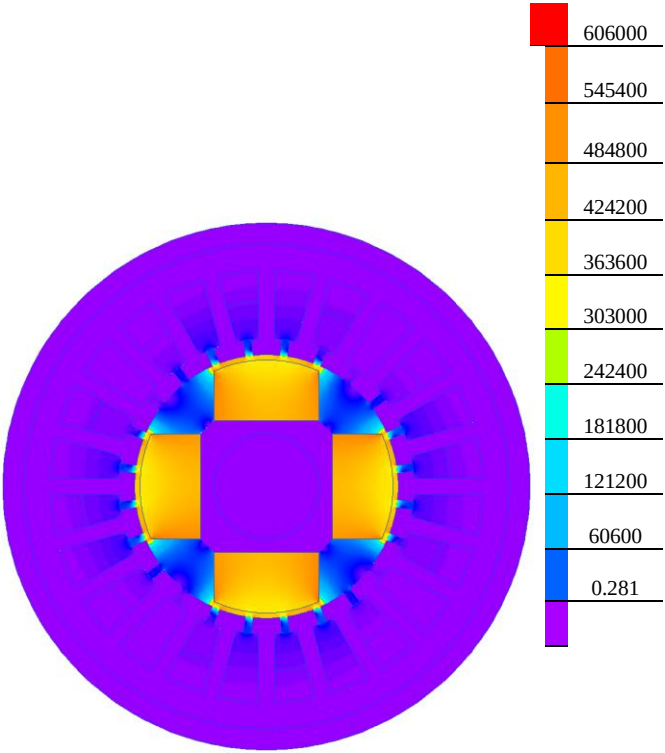
Results

Field lines



Results

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



Nonlinear dependencies

Table 2. BH-curve

B [T]	H [A/m]
0	0
0.19	20
0.65	60
0.87	80
1.04	95
1.18	105
1.24	120
1.272	140
1.3	160
1.32	180
1.34	200
1.36	240
1.45	2500

Table 3. BH-curve

B [T]	H [A/m]
0	0
0.73	400
0.92	600
1.05	800
1.15	1000
1.28	1400
1.42	2000
1.52	3000
1.58	4000

1.6 6000