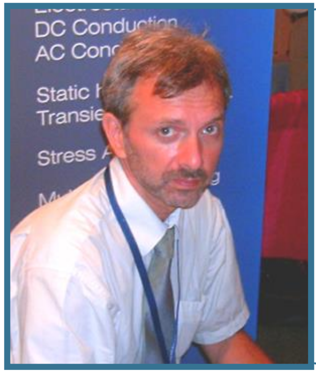
Electric current flow simulation with QuickField 6.3

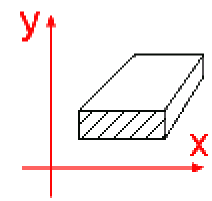


Vladimir Podnos,
Director of Marketing and Support,
Tera Analysis Ltd.

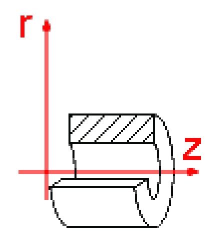
Alexander Lyubimtsev
Support Engineer,
Tera Analysis Ltd.

QuickField 6.3

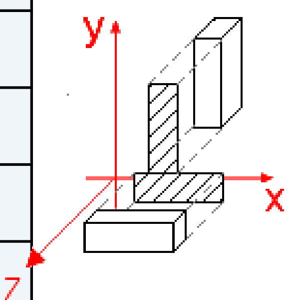
Magnetic analysis suite	
Magnetic Problems	2D Magnetostatics
	2D AC Magnetics
	2D Transient Magnetics
Electric analysis suite	
Electric Problems	2D Electrostatics and **2D DC Conduction**
	Electrostatics + 3D DC Conduction
	2D AC Conduction
	2D Transient Electric field
Thermo-structural analysis suite	
Thermal and mechanical problems	2D Steady-State Heat transfer
	3D Steady-State Heat transfer
	2D Transient Heat transfer
	2D Stress analysis



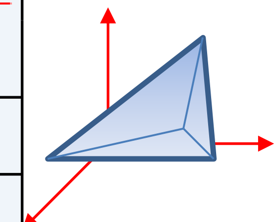
plane-parallel



axisymmetric

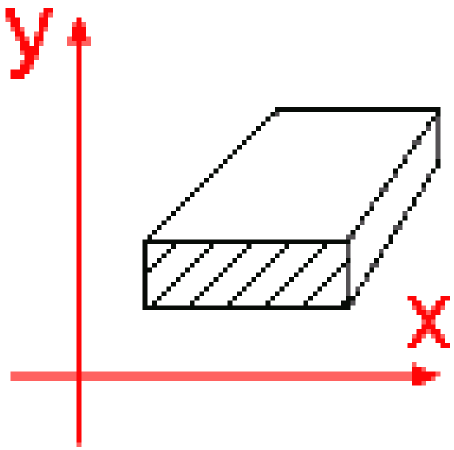


3D extrusion

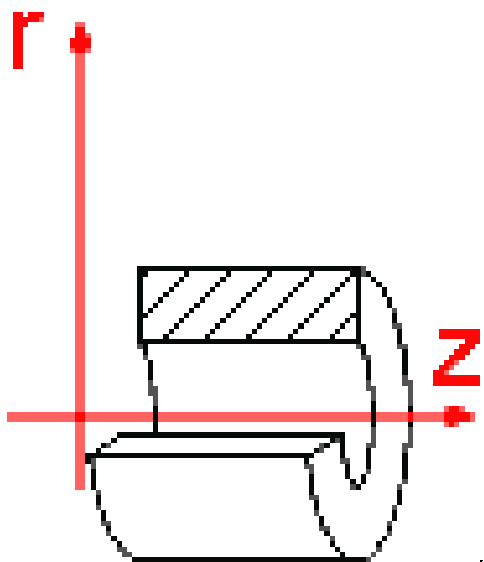


3D import

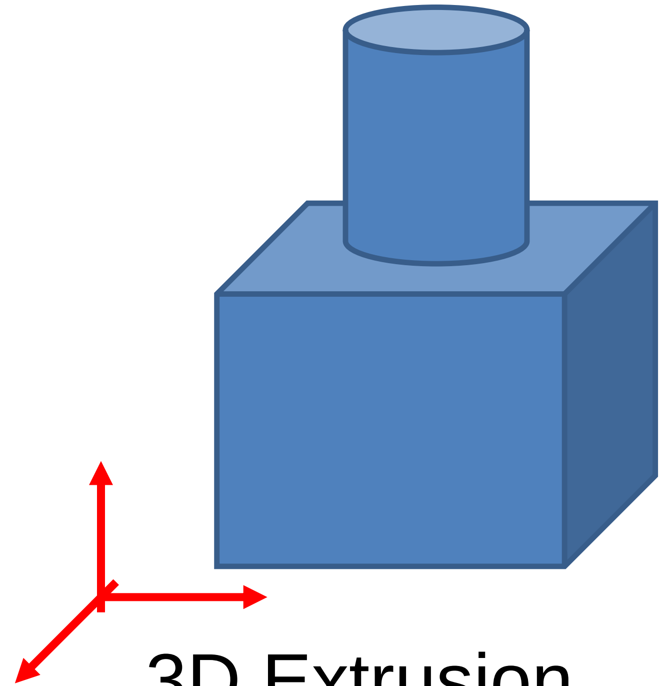
Geometric model



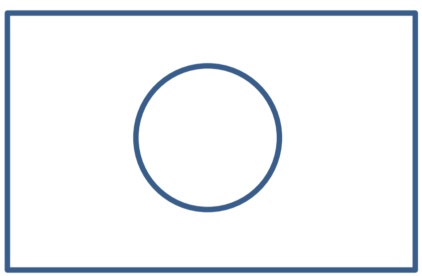
Plane-parallel (2D)



Axisymmetric (2D)

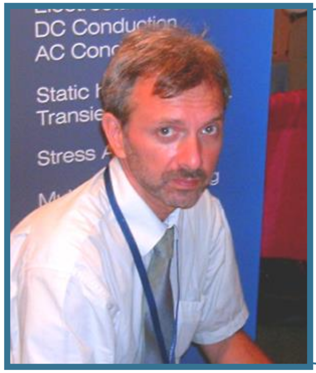


3D Extrusion



Plane-parallel (2D)
with heights

Electric current flow simulation with QuickField 6.3



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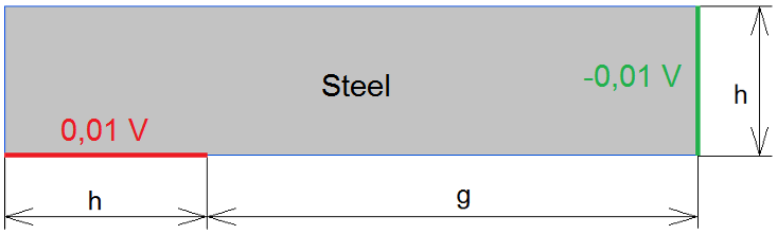
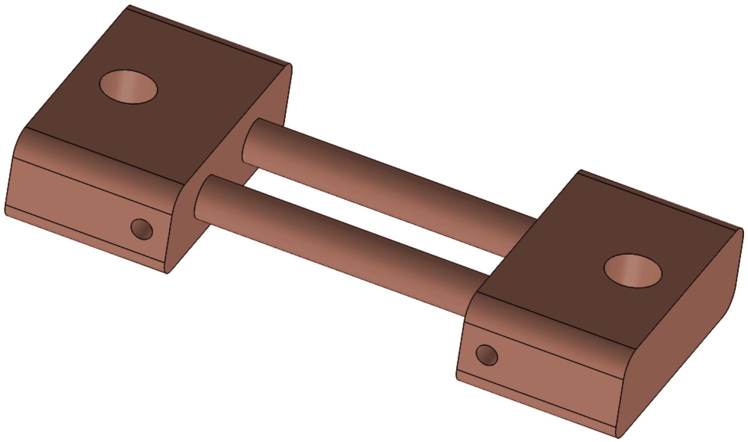
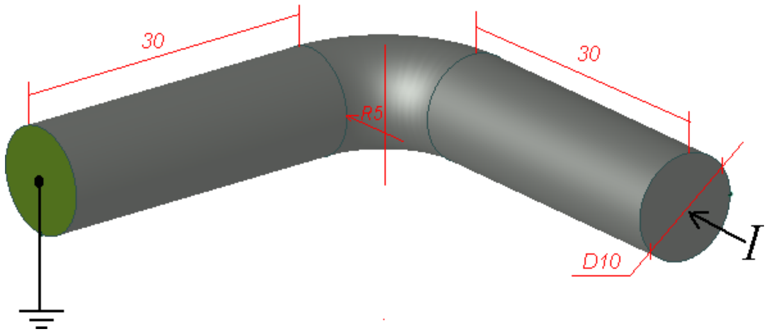
Electric current flow simulation with QuickField 6.3



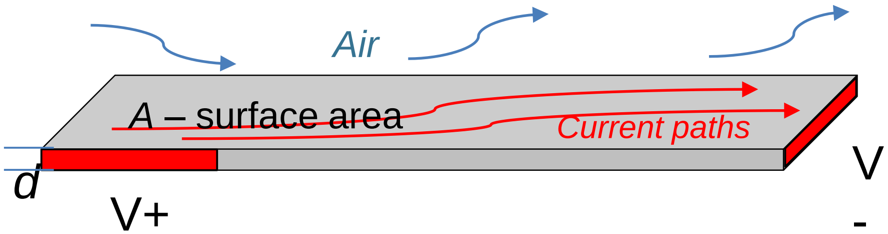
Thin film heater Joule losses



DC shunt voltage drop

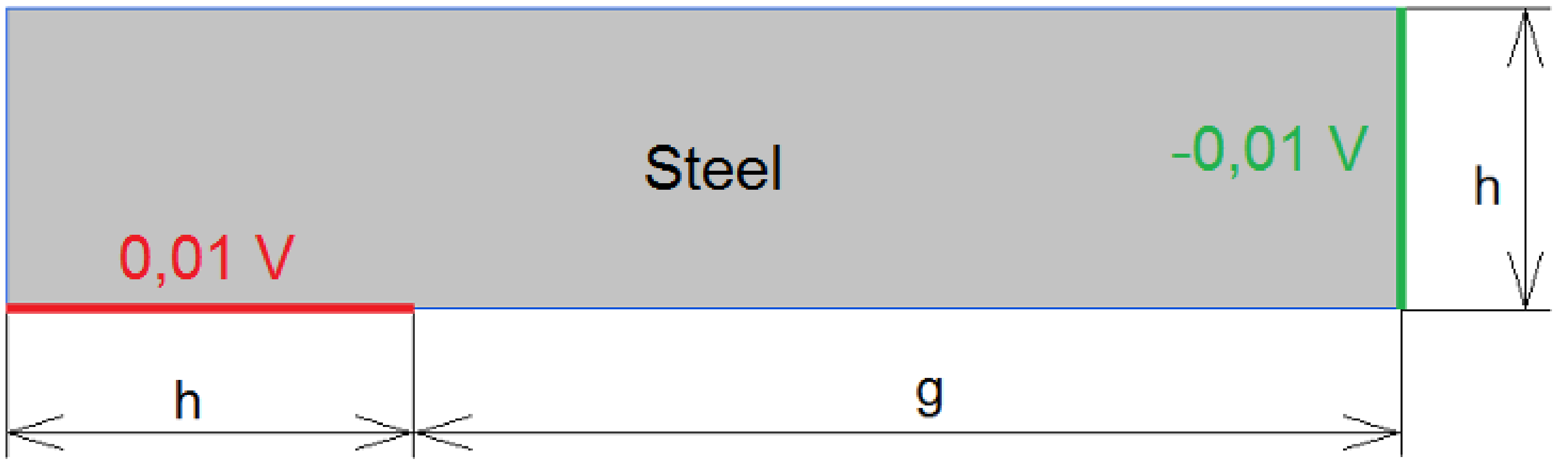


Bent copper wire resistance



Thin film heater temperature

Thin film heater power



Problem specification:

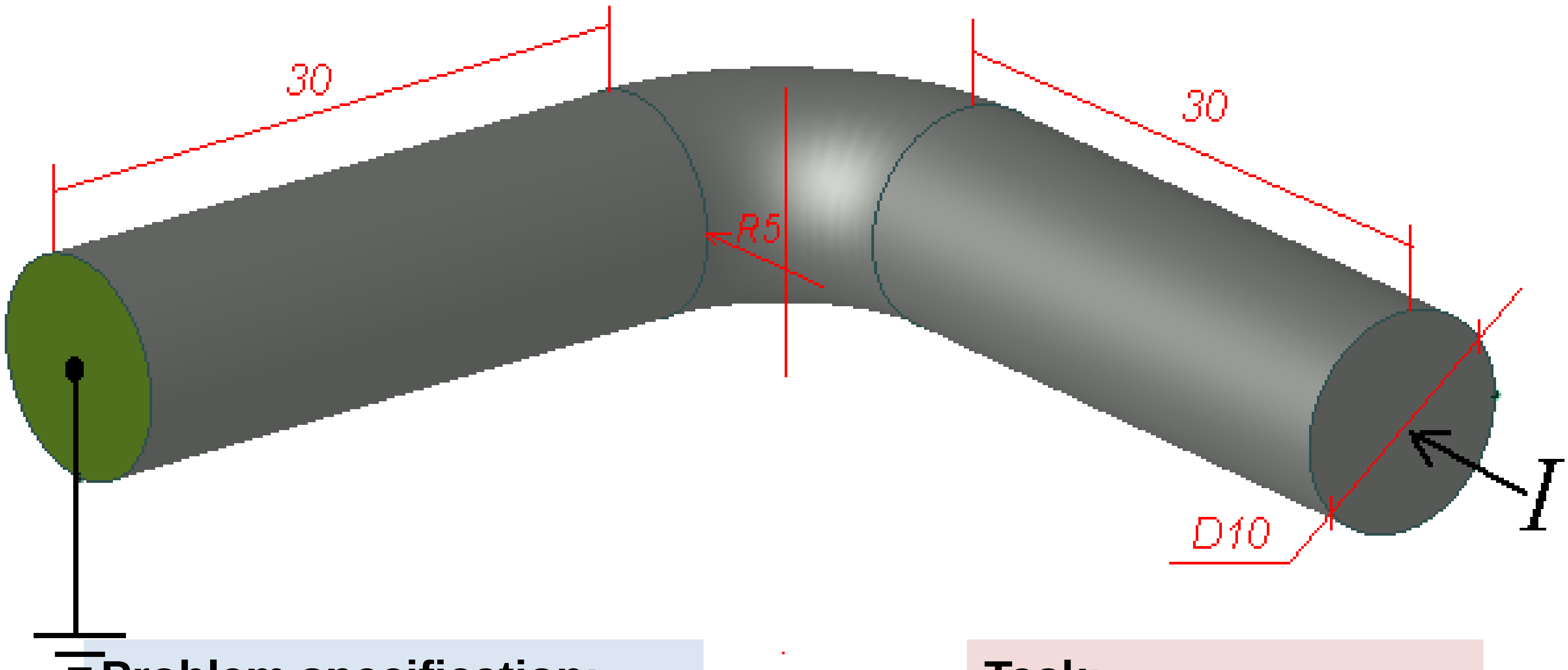
Electrical conductivity of the steel
$\gamma = 10 \cdot 10^6$ S/m,
h = 6 mm, g = 20 mm,
d = 0.1 mm - thickness of the plate

Tasks:

Calculate Joule losses

www.quickfield.com/advanced/thin_film_resistance.htm

Bent copper wire resistance



Problem specification:

Copper electric conductivity
σ = 56e6 S/m.

Current I = 100 A

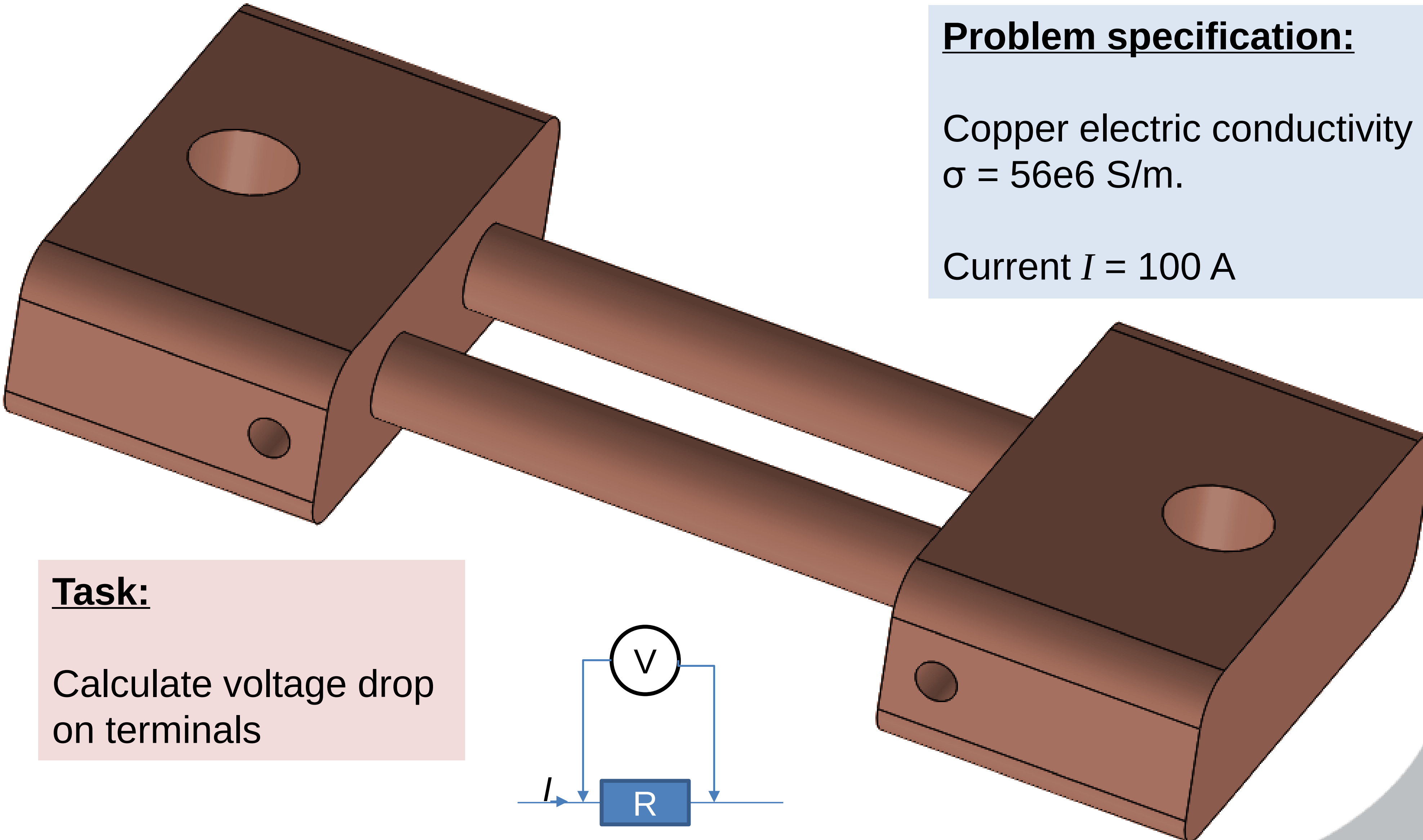
Task:

Calculate resistance.

$R = \Delta V / I$ [Ohm]

www.quickfield.com/advanced/bent_copper_wire_resistance.htm

DC shunt resistance



Problem specification:

Copper electric conductivity
σ = 56e6 S/m.

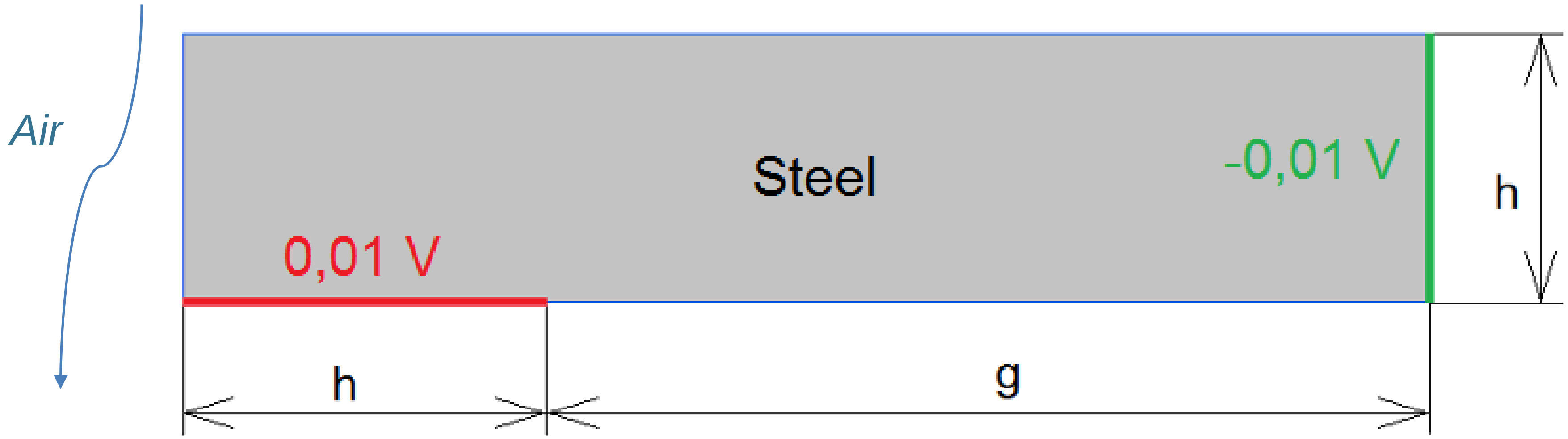
Current I = 100 A

Task:

Calculate voltage drop
on terminals

www.quickfield.com/advanced/electric_shunt.htm

Thin film heater temperature



Electric problem

Geometry model: ⟷ common geometry model

Data:
Electrical conductivity
Potential difference

Results:
Current density, Joule losses

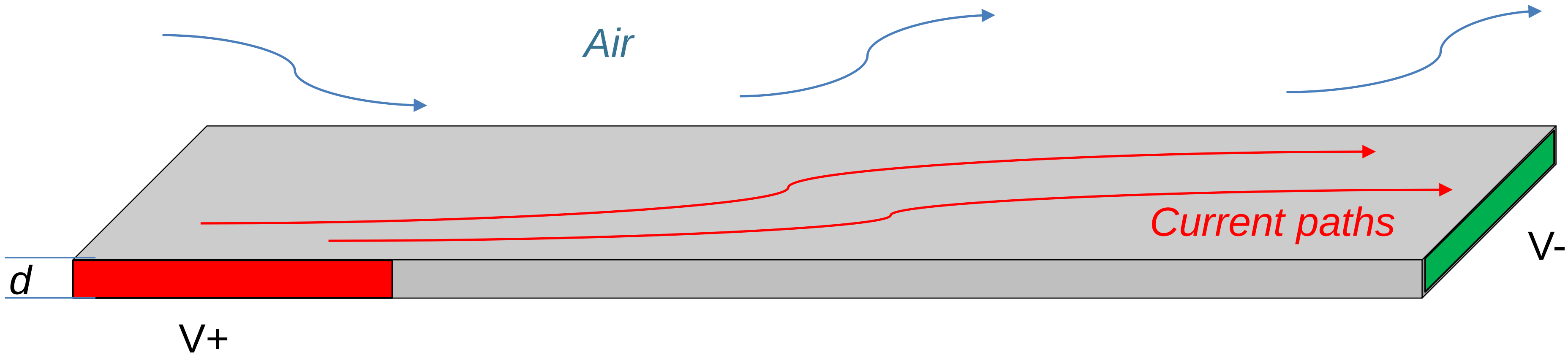
Thermal problem

Geometry model:

Data:
Thermal conductivity
Joule losses
Convection

Results:
Temperature distribution

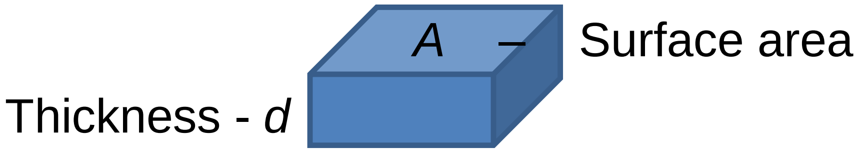
Thin film heater temperature



Convection from side surfaces is already included in model

Convection from top surface

$Q\ [W] = \alpha \cdot \Delta T \cdot A$



Volume heat sink

$Q\ [W] = -\ k \cdot \Delta T \cdot (A \cdot d)$ $\qquad k = \alpha / d$

www.quickfield.com/advanced/thin_film_resistance.htm

$\alpha = 10\ W/K \cdot m^2$, $d = 0.1$ mm.
$k = 10/0.0001 = 100000$