

3D ACTUATOR

Flux 3D : Training example

Overview

Studied device

- A linear actuator

Functionality

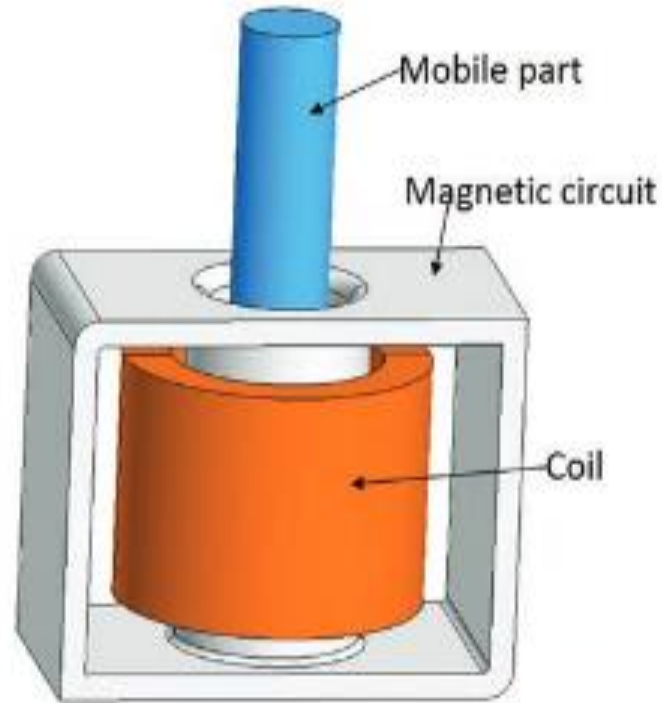
- The rotation of the target wheel near the tip of the sensor changes the magnetic flux, creating an analog voltage signal that can be recovered in probes.



Device description in Flux

The device consists of an actuator

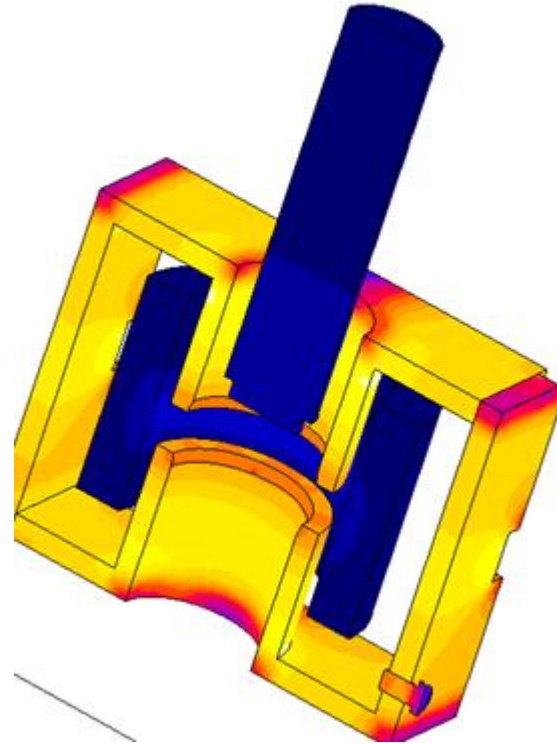
- One Magnetic Core
- One coil
- One mobile part



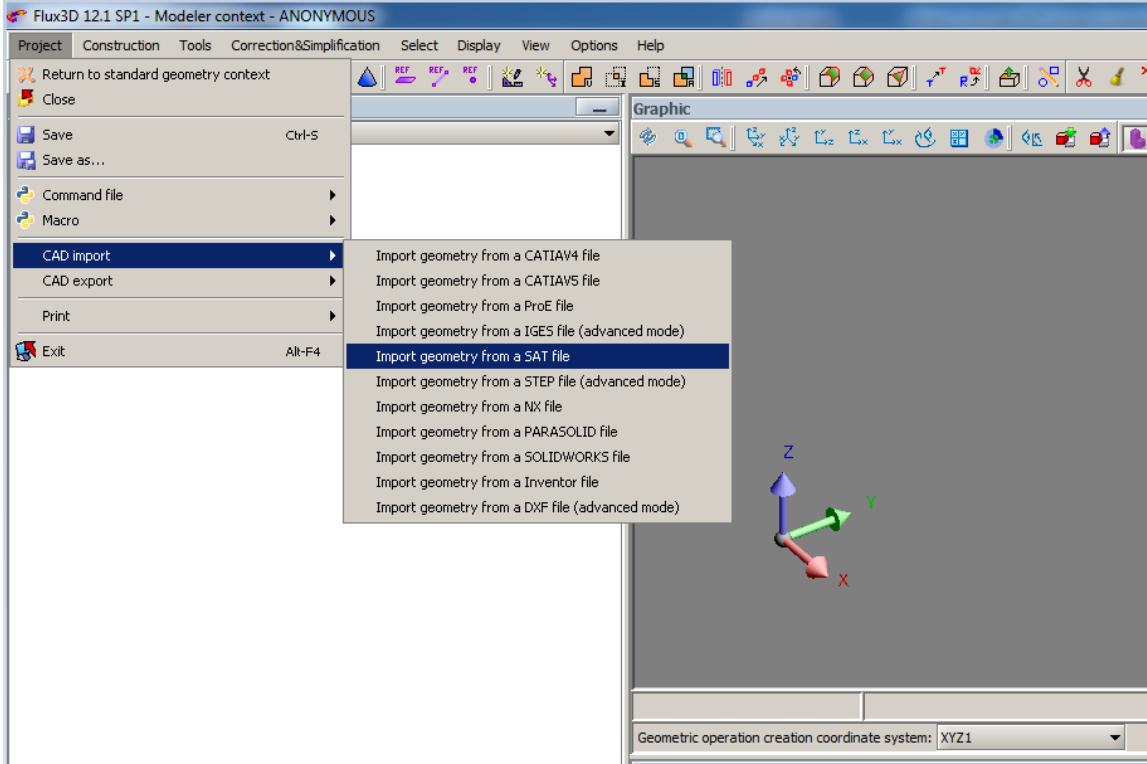
process

Process outline

- Import the SAT file
- Simplify the geometry
- Create the physics
- Solve the project
- Check the results



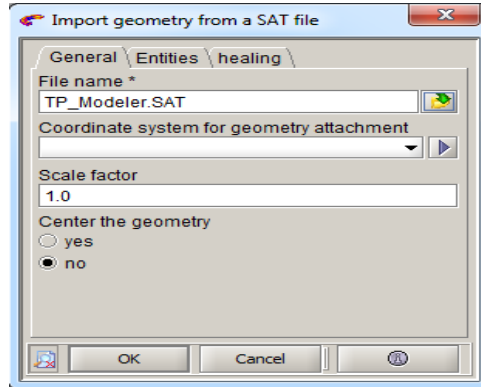
Linear Actuator - Import



Linear Actuator - Import

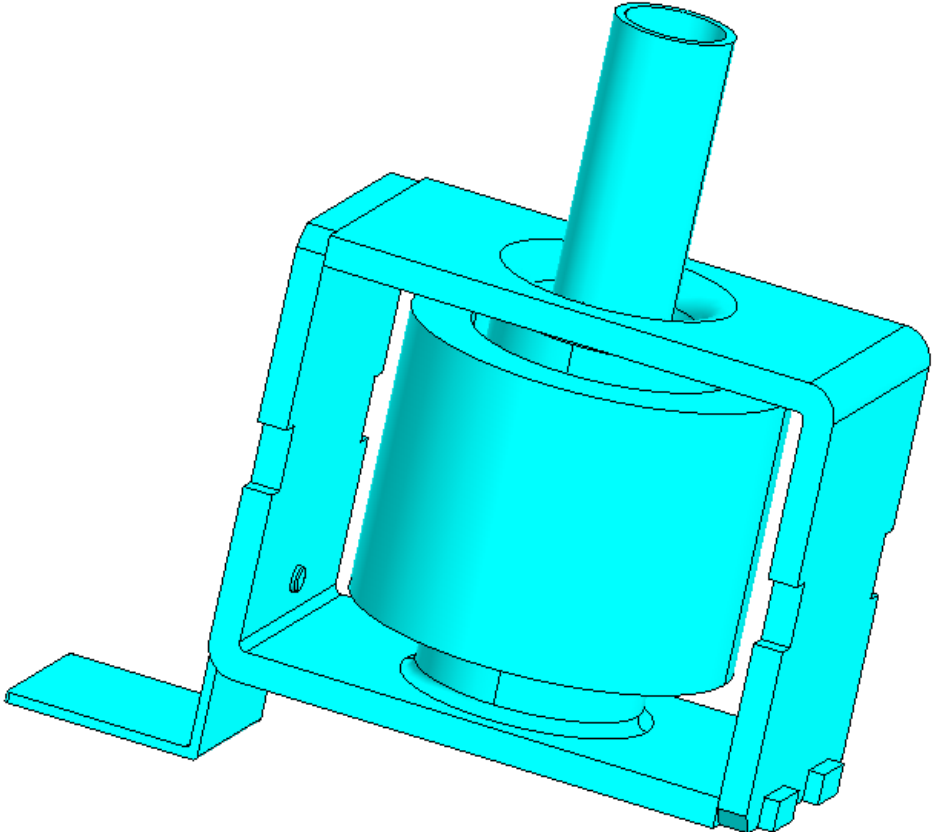
Import geometry :

- Check options



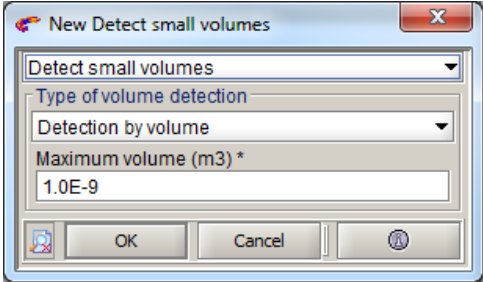
- Save the project:Project → Save As → Actuator

Linear Actuator - Import

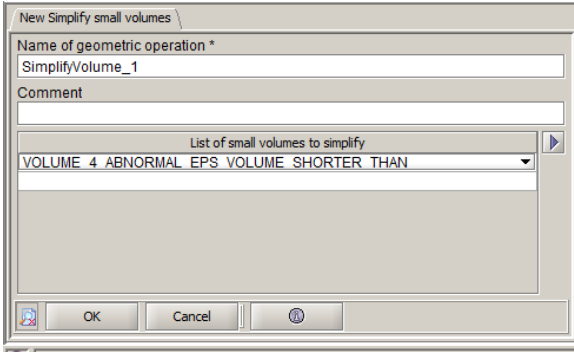


Detect and simplify small volumes

Correction&simplification → Detect entities → Detect small volumes

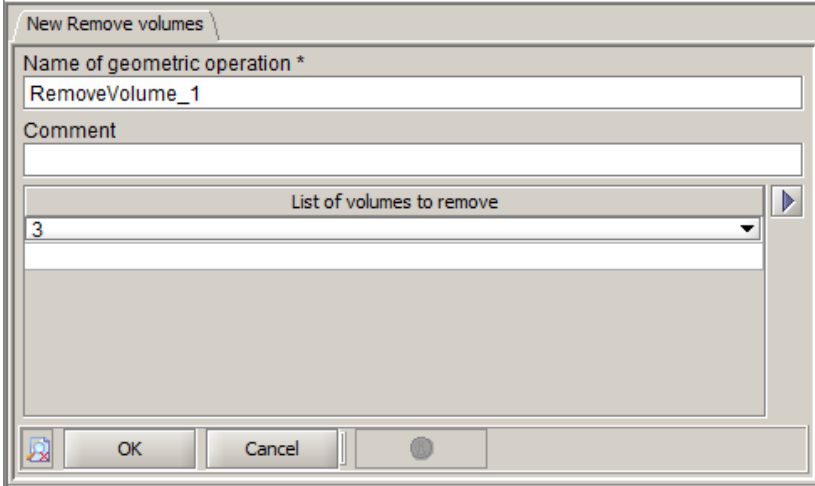
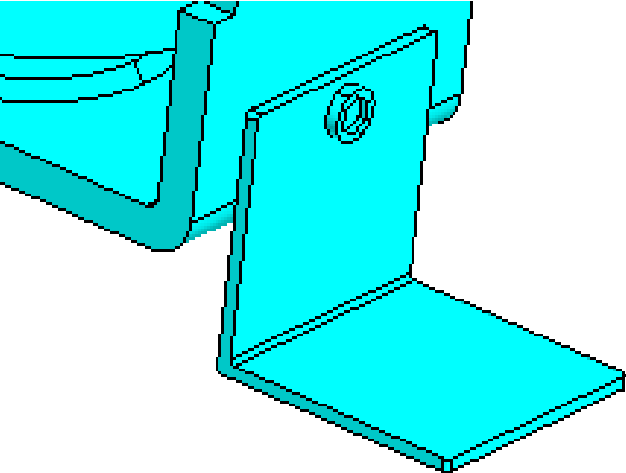


Correction&simplification → Simplify entities → Simplify small volumes



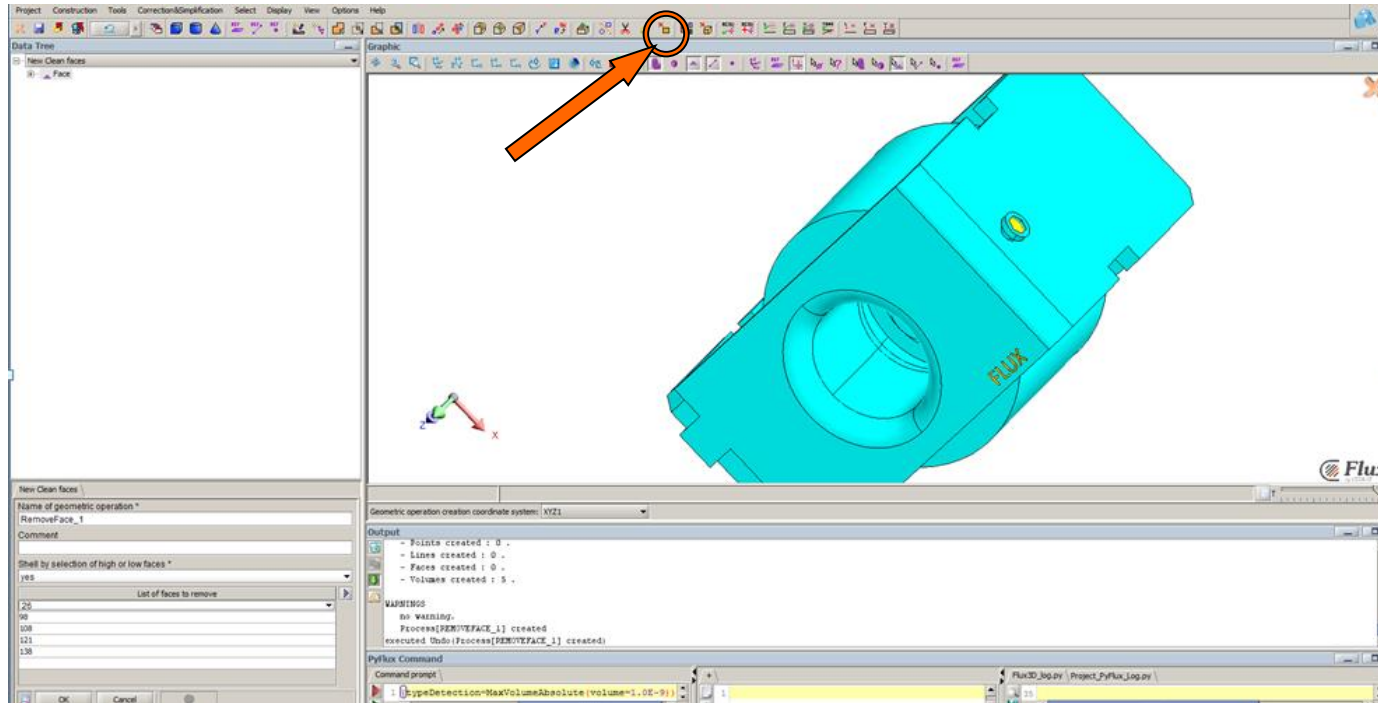
Simplify geometry

Correction&simplification → Remove volumes → New



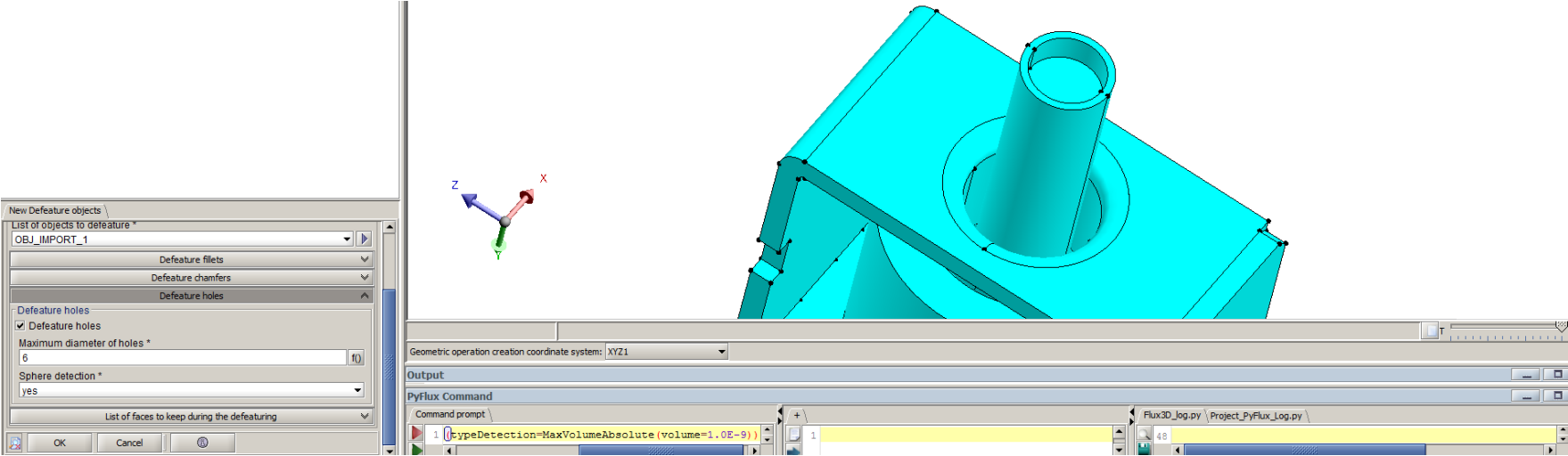
Simplify geometry

Simplify the geometry : use the tool Clean faces



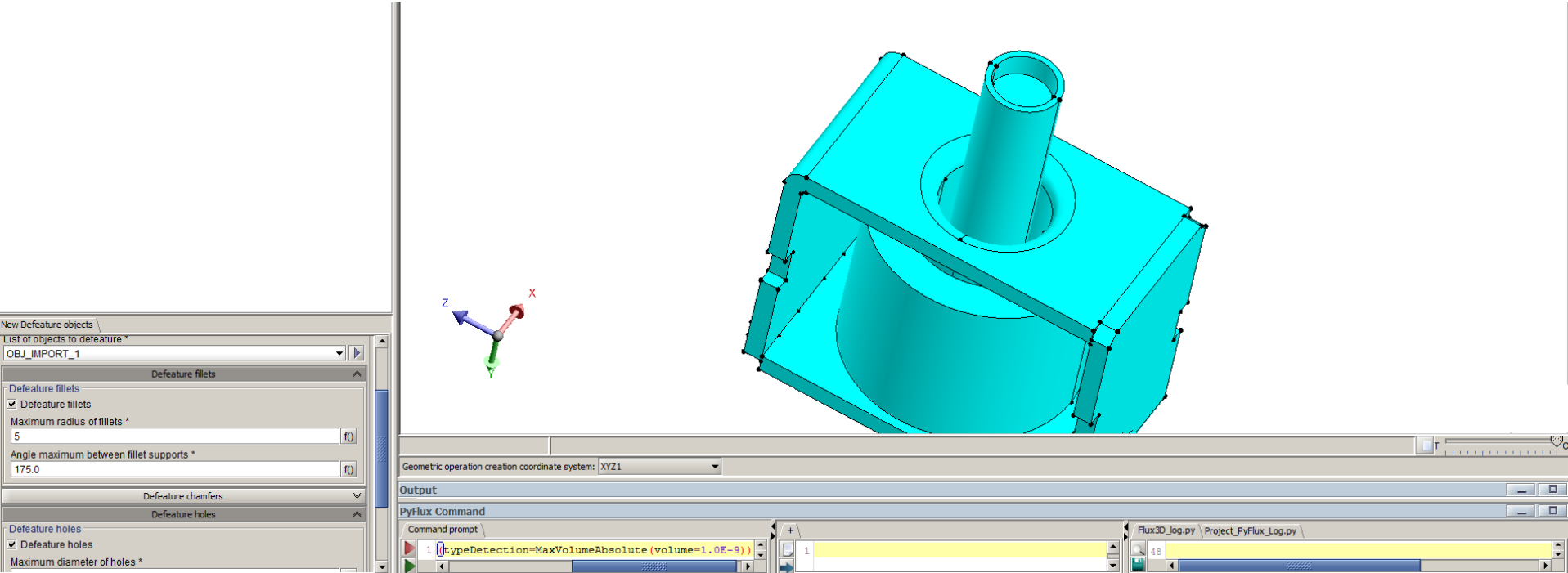
Geometry: defeaturing of holes

Correction&simplification → Defeature holes/files/chamfers → New



Geometry: defeaturing of filets

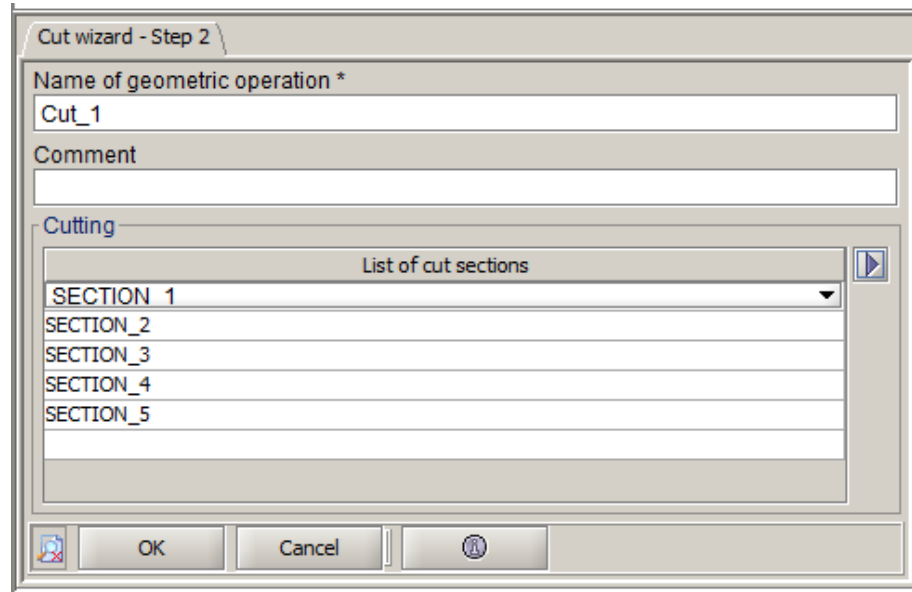
Correction&simplification → Defeature holes/filets/chamfers → New



Geometry: Cut the device

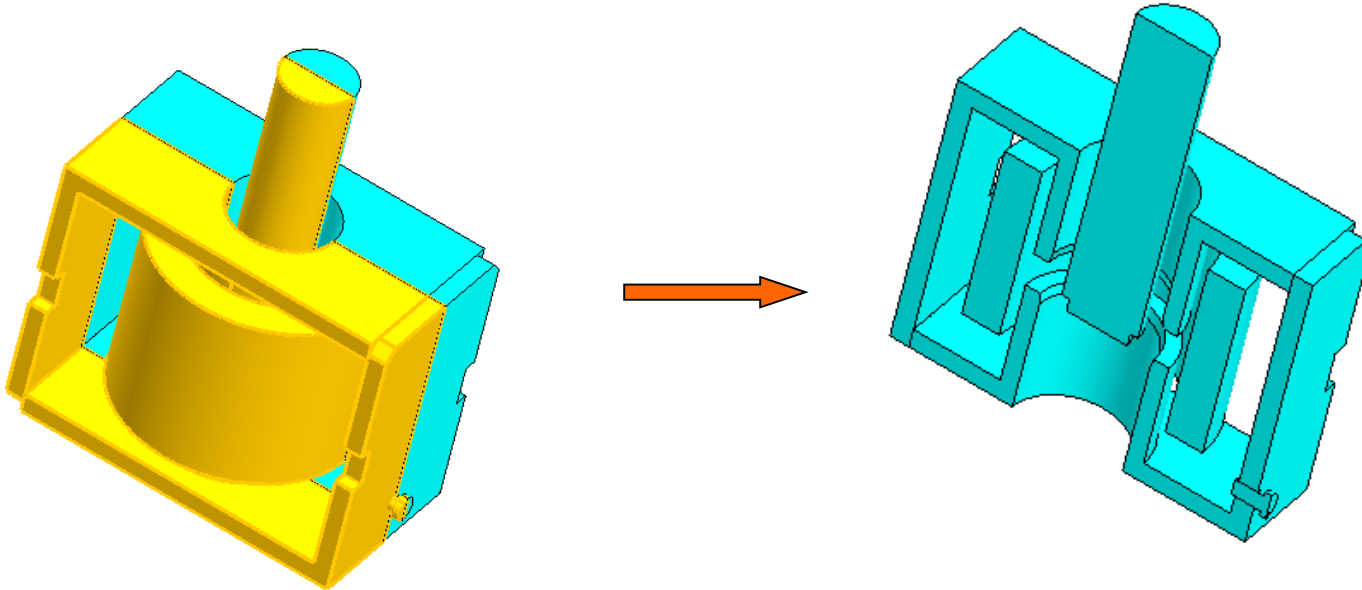
Correction&simplification → Cut objects→ Object cut

Cut along YZ and choose all the sections



Geometry: Cut the device

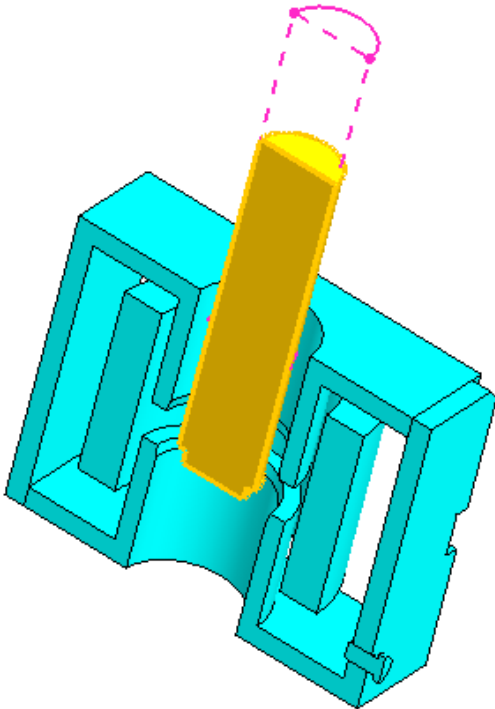
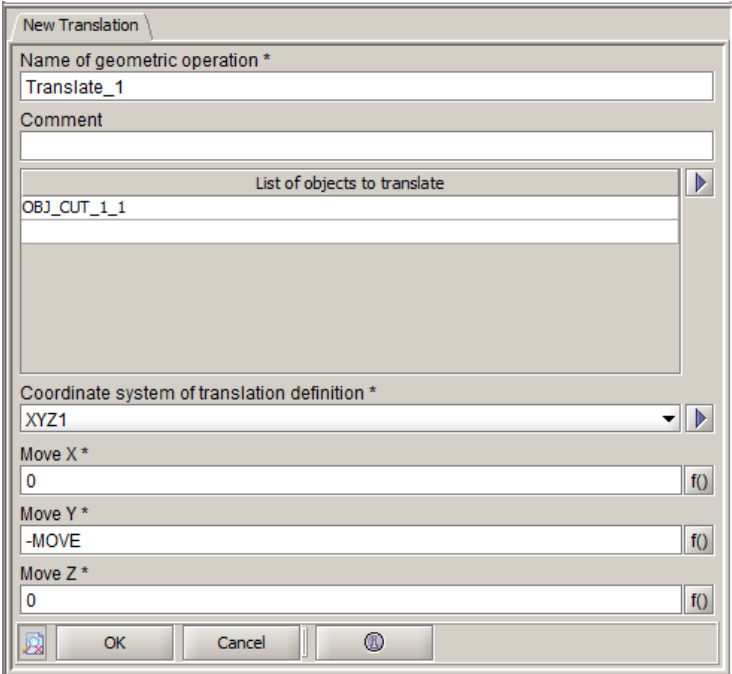
Select Obj_cut_1_2, 1_3 and 1_6 → "Right click" → Force delete



Geometry

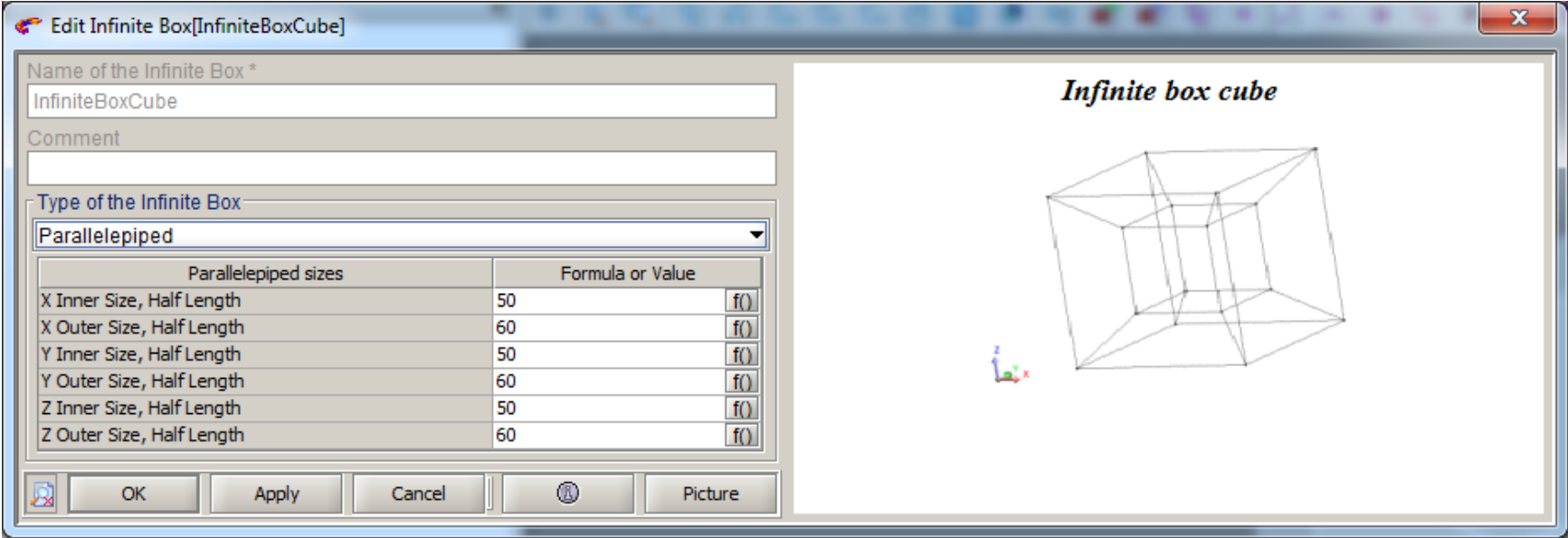
Tools→Translation→New

“Move” is a geometric parameter (equal to 5)



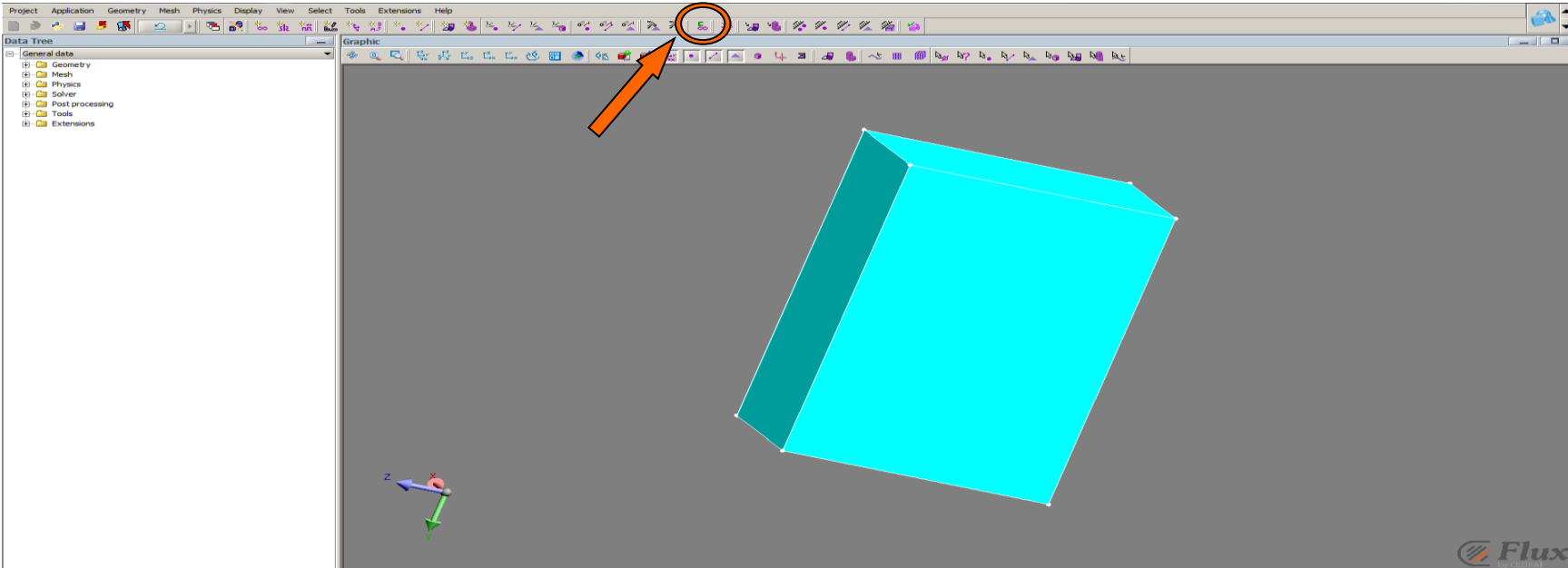
Linear Actuator – Infinity Box

Create InfiniteBox: Geometry → InfiniteBox → New



Linear Actuator – Infinity Box

Complete infinity Box

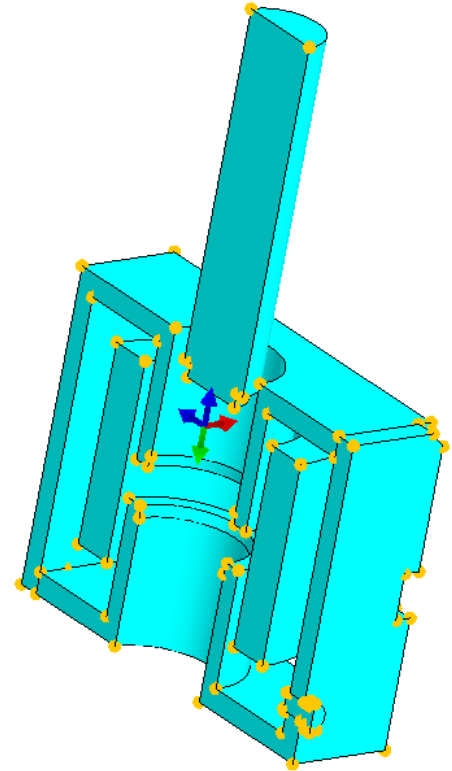
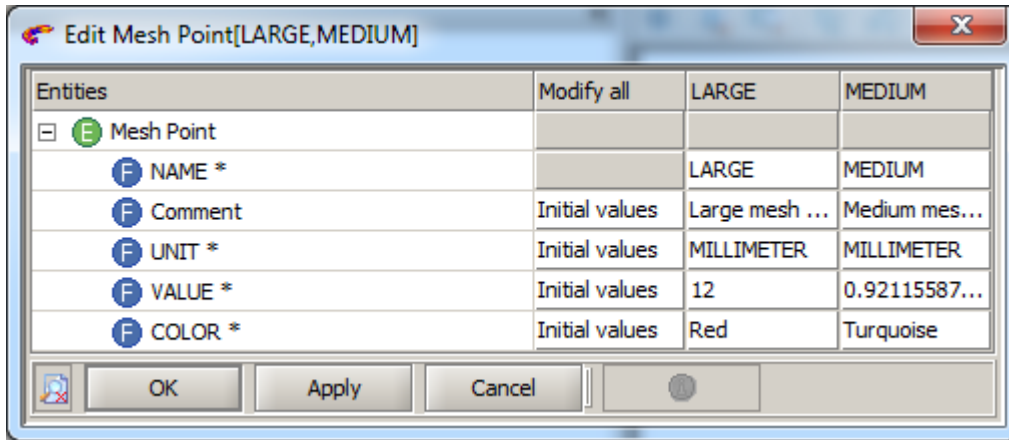


Meshing

Disable the aided mesh: mesh → aided mesh → inactivated

Select all the device points and assign “Medium” mesh point

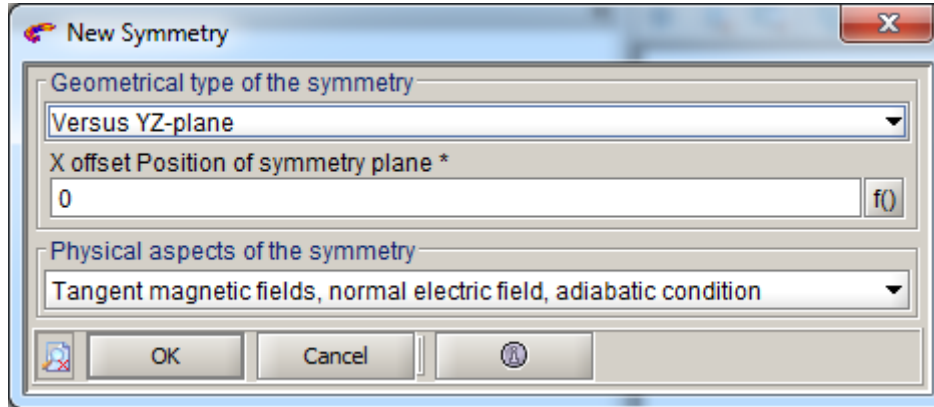
Select the points of the infinite box and assign “Large” Mesh point



Physics

Create the Application: Application → Define → Magnetic Magneto static 3D

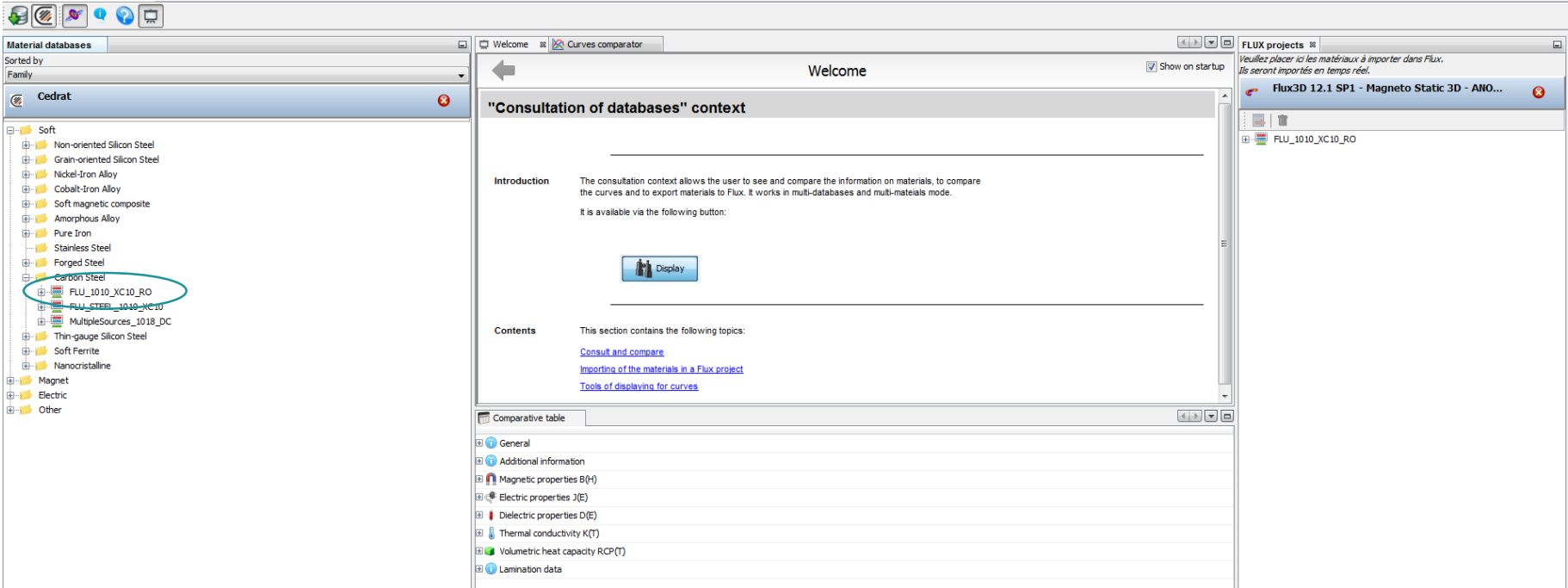
Create the symmetry: Physics → Symmetry → New



Mesh the domain: Mesh → Mesh domain

Physics

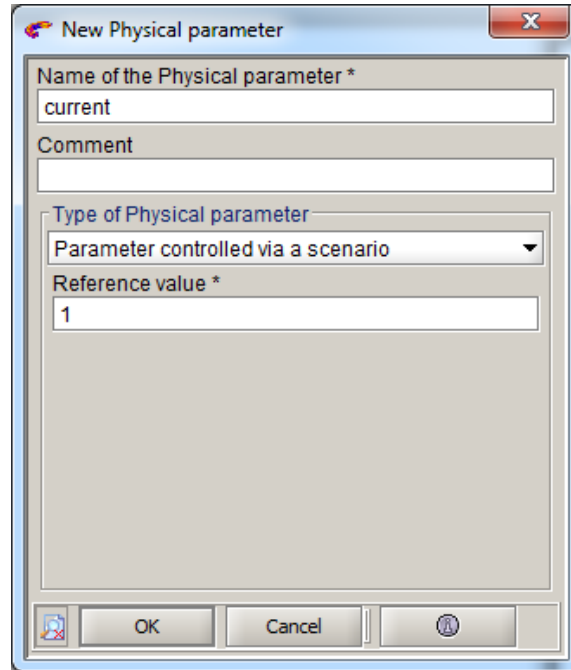
Import material from Material Manager: Physics →Material→Import from material manager



Physics

Create an I/O parameter to drive current value: Physics →Parameter/Quantity→I/O parameter →New

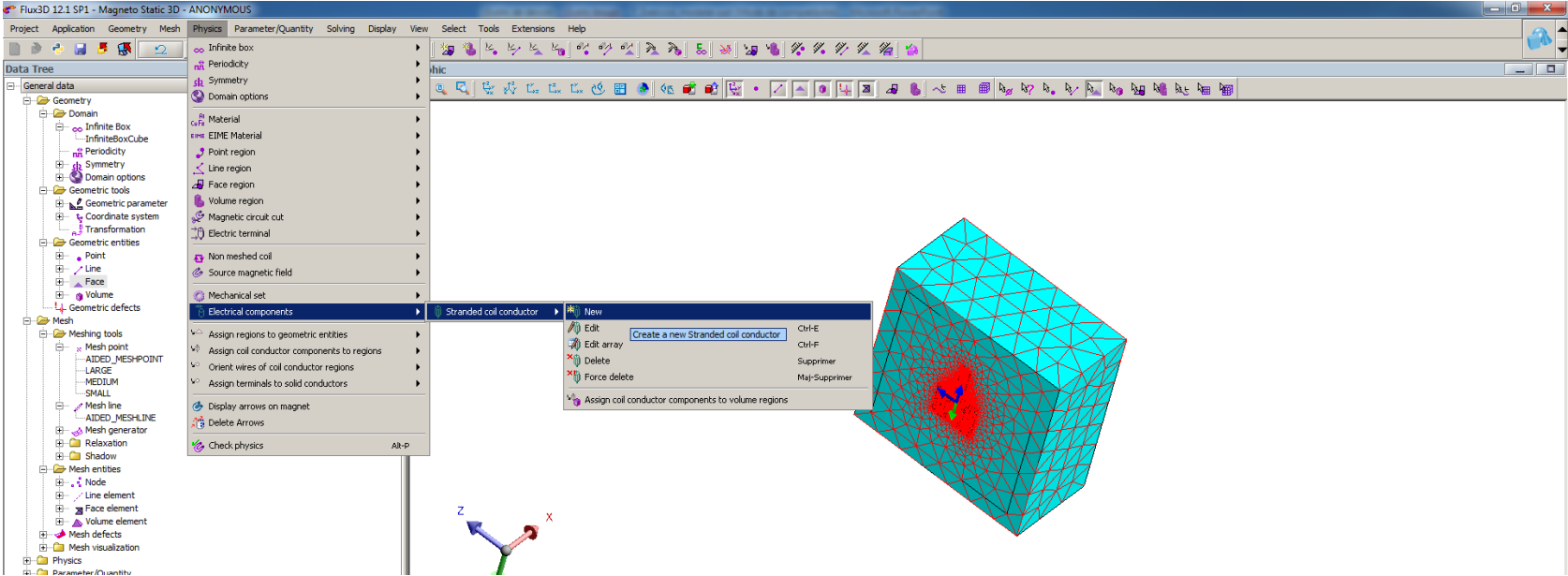
Value: “Current”



Physics

Create the coil conductor: Physics → Electric components → Stranded coil conductor → New

Value: “Current”



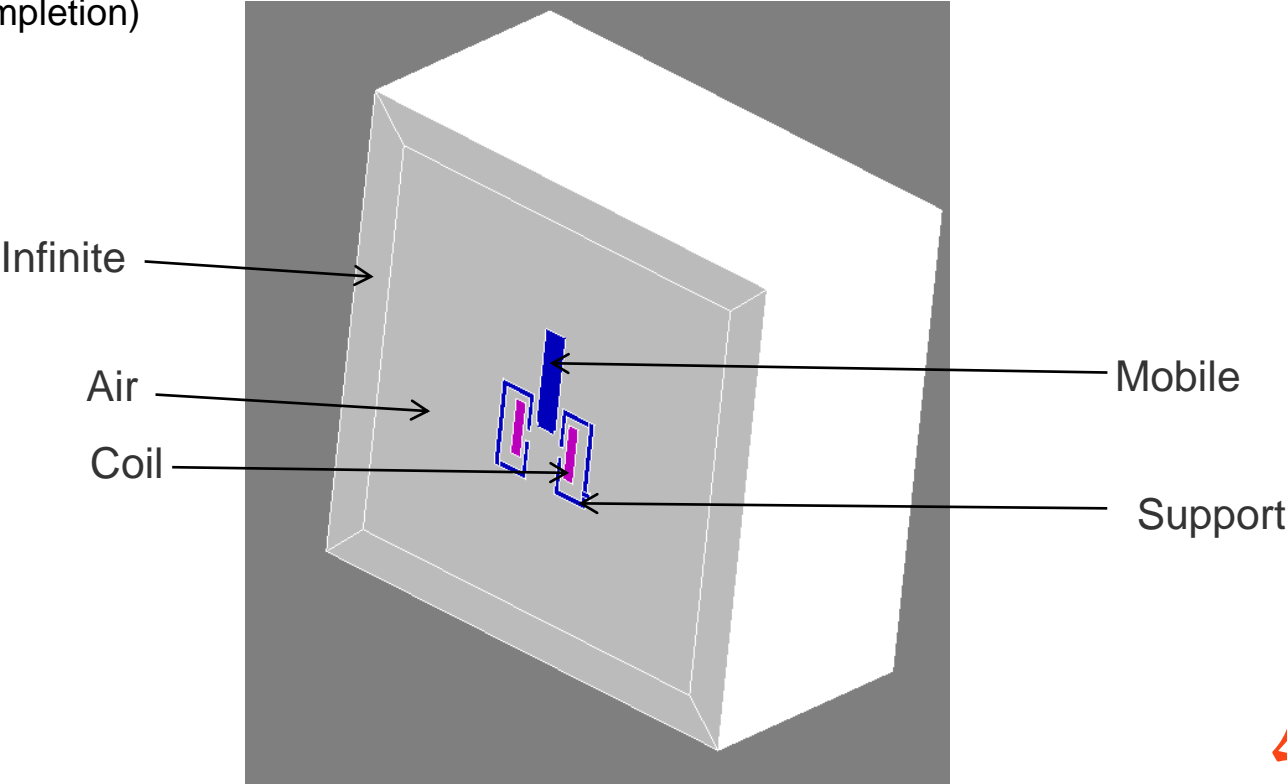
Physics

Create volume regions: Physics → Volume region → New

Name	Type	Material	Turn number	Component	Symmetries	Apparence
AIR	Air or vacuum region	-	-	-	-	White
COIL	Coil conductor	-	100	COILCONDUCTOR _1	in series	Cyan
MOBILE	Coil conductor	FLU_1010_XC1 0_RO	-	-	-	Magenta
INFINITE	Air or vacuum region	-	-	-	-	White
SUPPORT	Magnetic non-conducting region	FLU_1010_XC1 0_RO	-	-	-	Cyan

Physics

Assign regions to geometric entities: Physics → Assign Regions to geometric entities → Assign regions to volume (Completion)

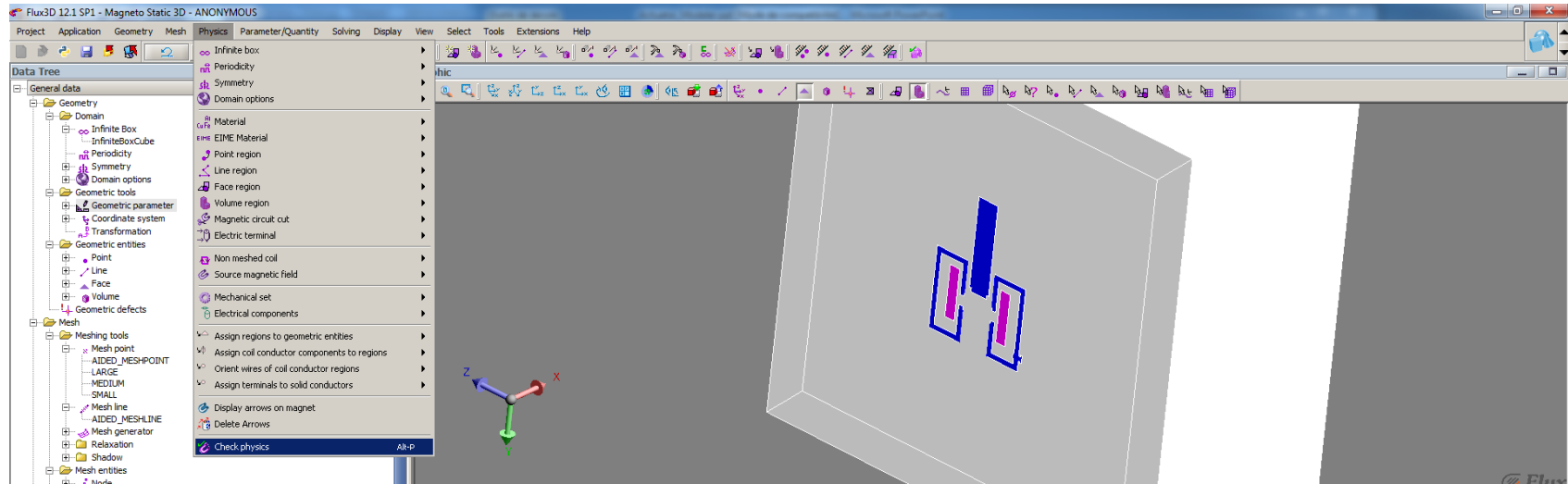


Physics

Assign terminals to the coil: Physics → Orient wires of coil conductor regions → Completion mode

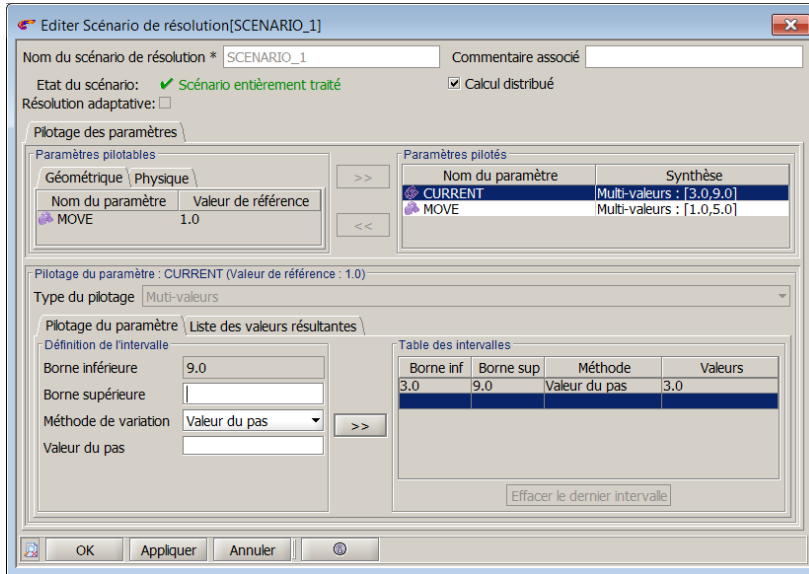
Select external terminals → Face 99

Check the physics



Solving

Create the solving scenario: Solving → Solving scenario → New



Value of current: From 3A to 9A
with a step value of 3A

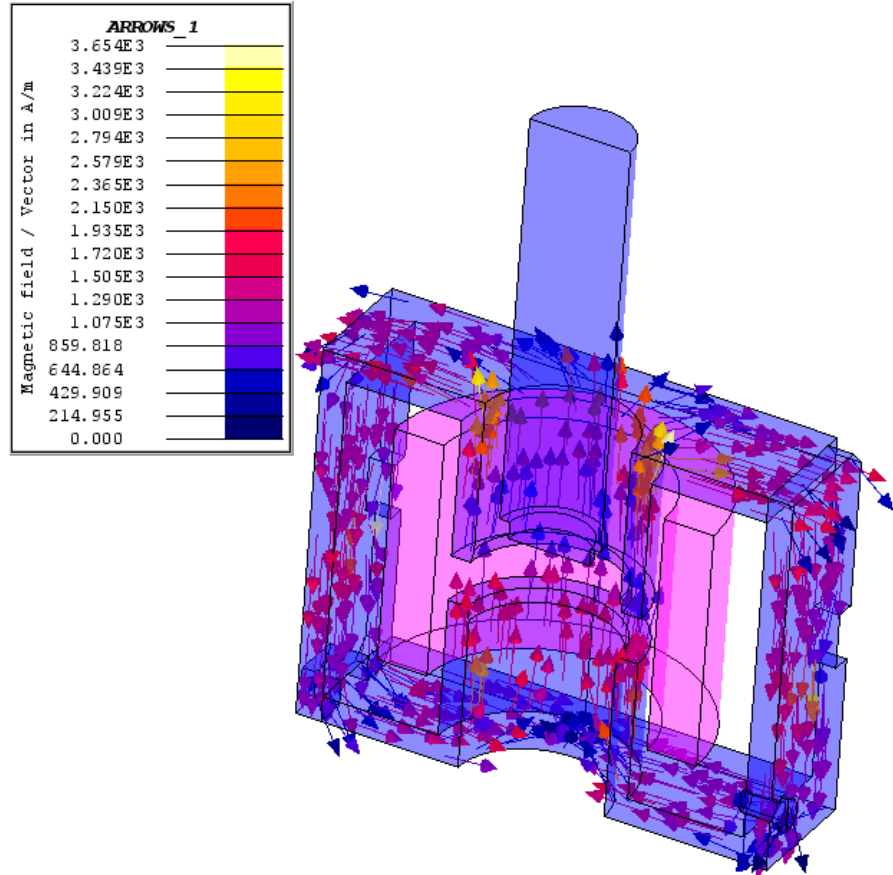
Value of move: from 1 to 5 with a
step value of 3

Solve the project: Solving → Solve → In a new project: Actuator_solved

Post processing

Display the magnetic field arrows:
Graphic → Arrows spatial Group → New

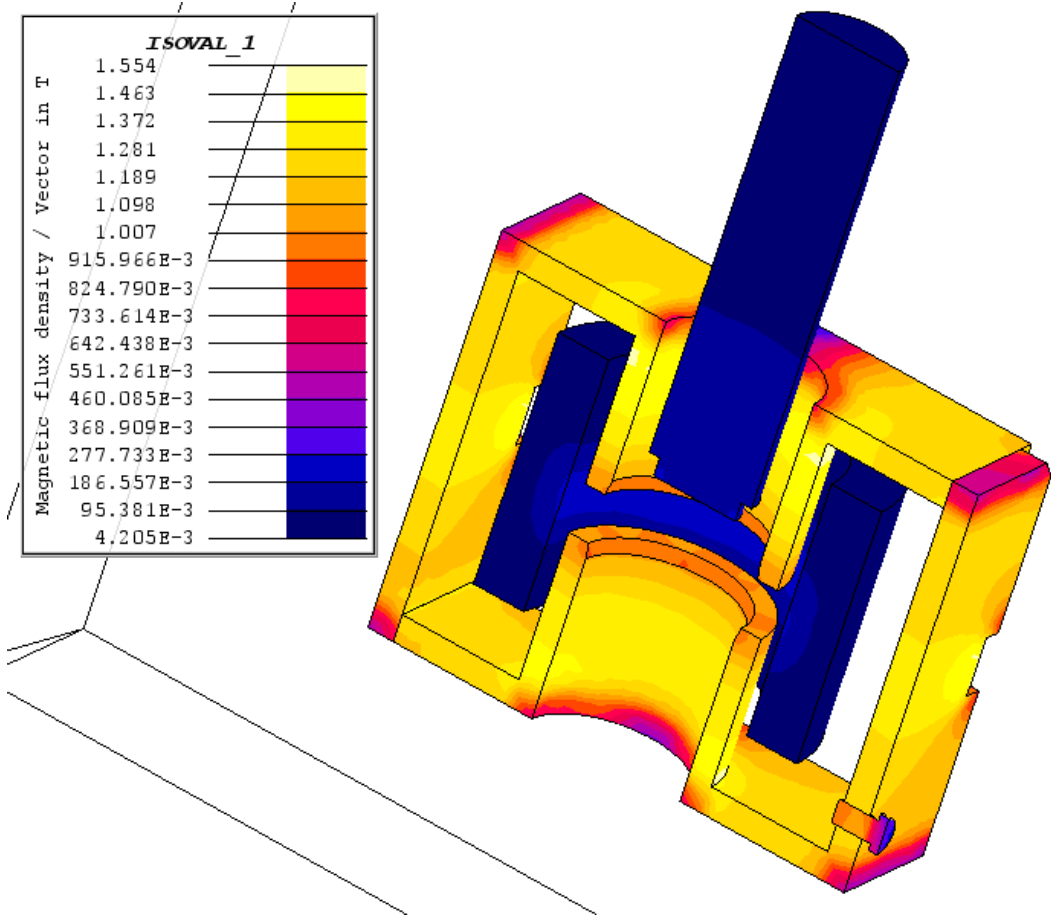
Select H on support



Post processing

Display the magnetic field arrows :
Graphic → Isovalues → New

Select B on “No vaccum”

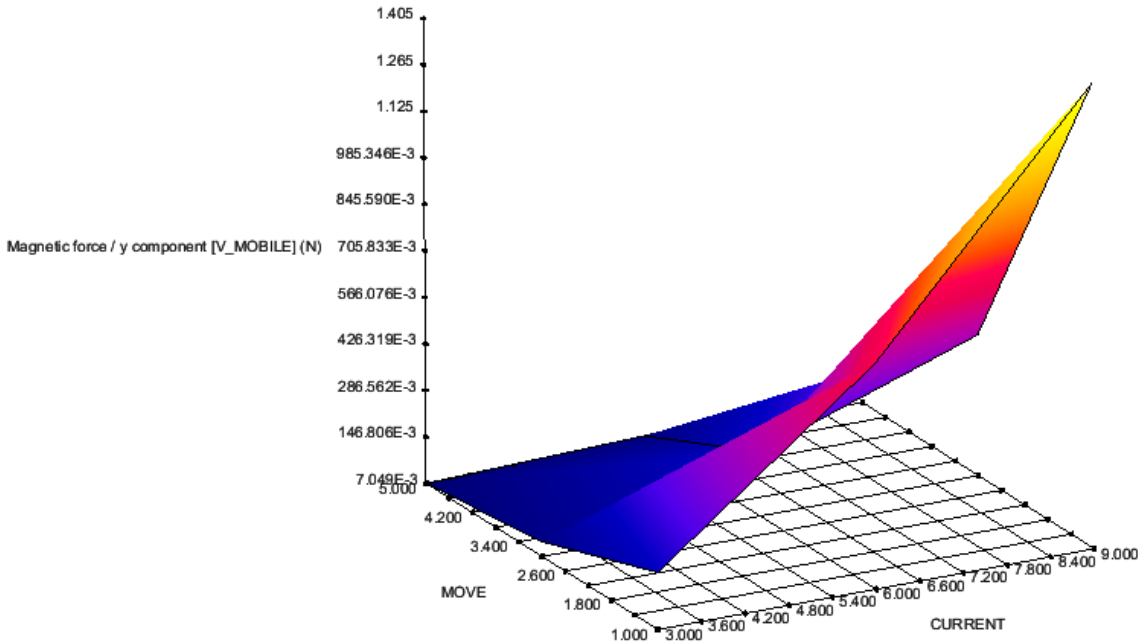


Post processing

Create a 3D curve : Curve → 3D curve
2 I/O parameters → New

Select the Y component of the
magnetic force on the mobile part

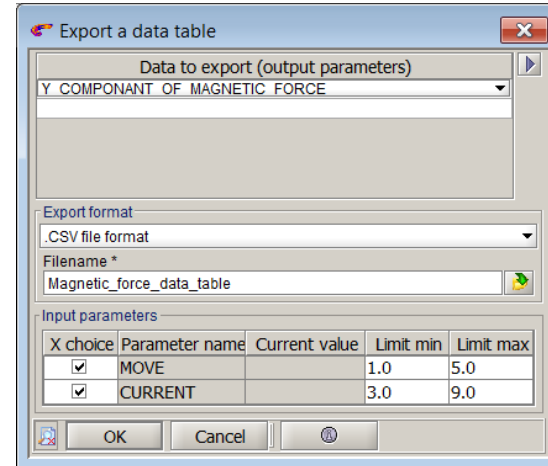
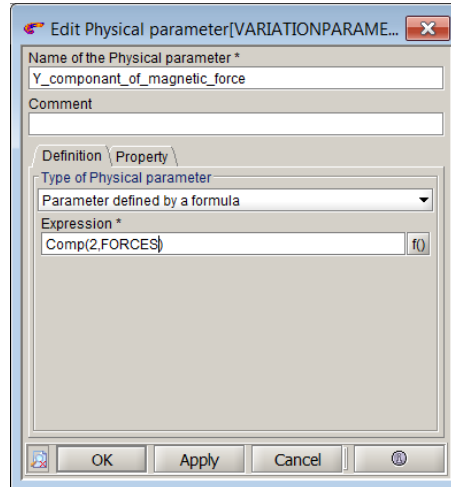
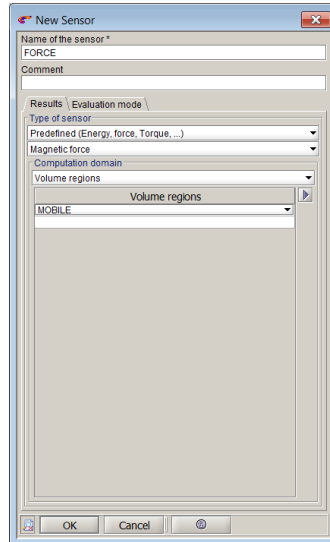
MAGNETIC_FORCE



Post processing

Extract forces data table:

- Create a force sensor: Advanced → Sensor → New
- Create an I/O parameter to extract just the Y component of the force on the mobile part: Advanced → Parameter I/O → New
- Export the data table: Data exchange → Export quantity → Export a data table



Post processing

Extract forces data table:

- We obtain the forces data table on a csv file as output:

MOVE	CURRENT	Y_COMPONENT_OF_MAGNETIC_FORCE
0.1000000000000000E+01	0.3000000000000000E+01	0.1817637071137207E+00
0.3000000000000000E+01	0.3000000000000000E+01	0.5035884740582516E-01
0.5000000000000000E+01	0.3000000000000000E+01	0.6972915523876870E-02
0.1000000000000000E+01	0.6000000000000000E+01	0.6956145766925051E+00
0.3000000000000000E+01	0.6000000000000000E+01	0.1968421347305795E+00
0.5000000000000000E+01	0.6000000000000000E+01	0.2801183162208053E-01
0.1000000000000000E+01	0.9000000000000000E+01	0.1424938790903286E+01
0.3000000000000000E+01	0.9000000000000000E+01	0.4235336088209888E+00
0.5000000000000000E+01	0.9000000000000000E+01	0.6400859106696966E-01



THANK YOU

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