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## Femtet Seminar

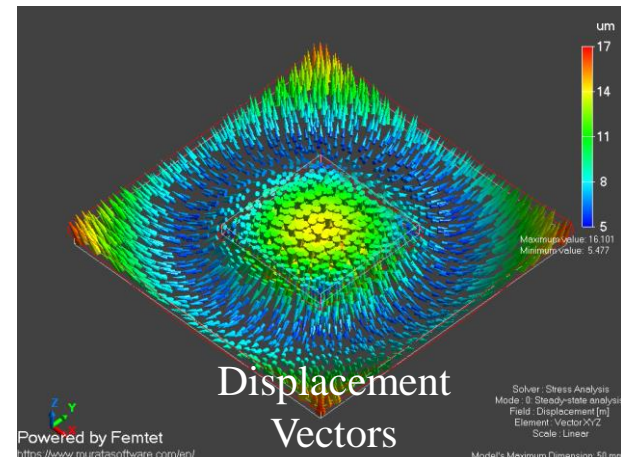
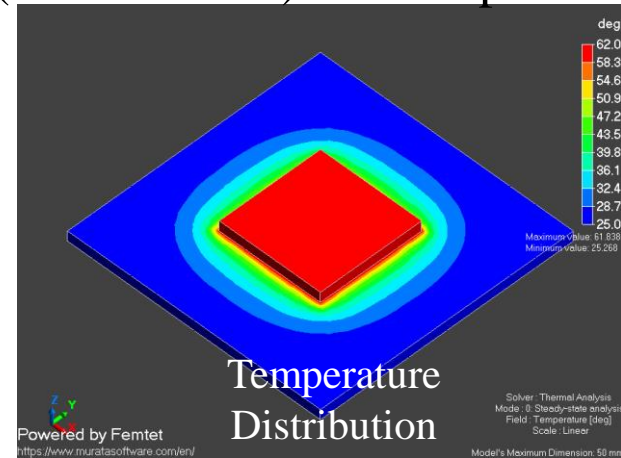
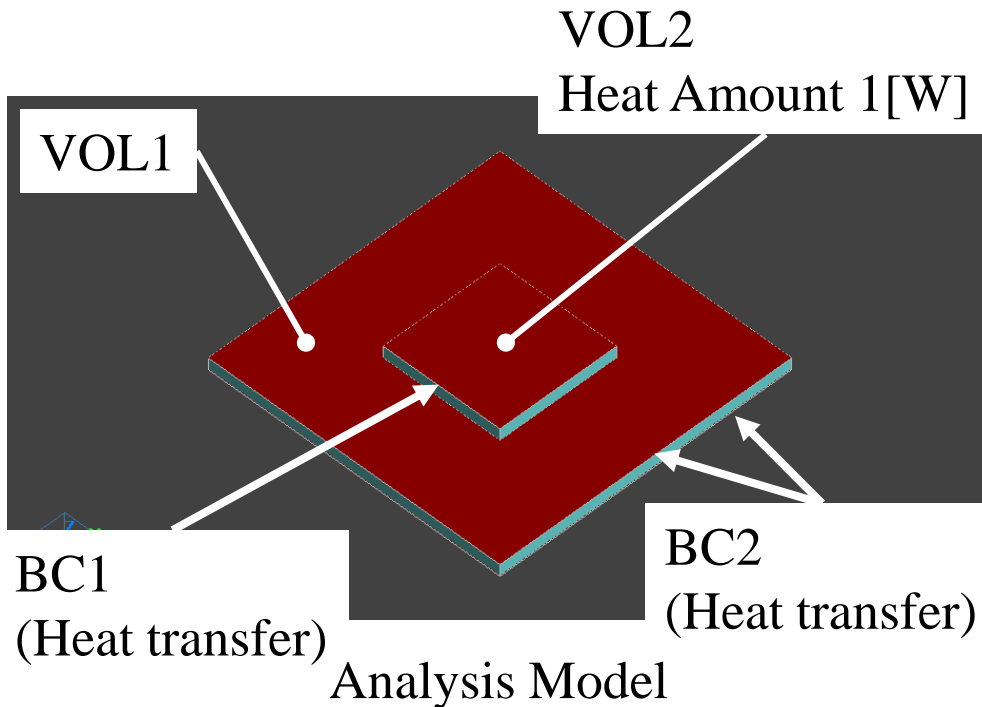
# Stress Analysis & Thermal Analysis Exercise

202009

- Exercise with Example 2 of Thermal-Stress Analysis
- Create a quarter model and verify the results match with full model
  - Cut body
    - Apply boundary condition to the plane of symmetry
    - Modify heat source
    - Execute analysis
- Change analysis condition from steady-state to transient
- Give time dependency to the heat source

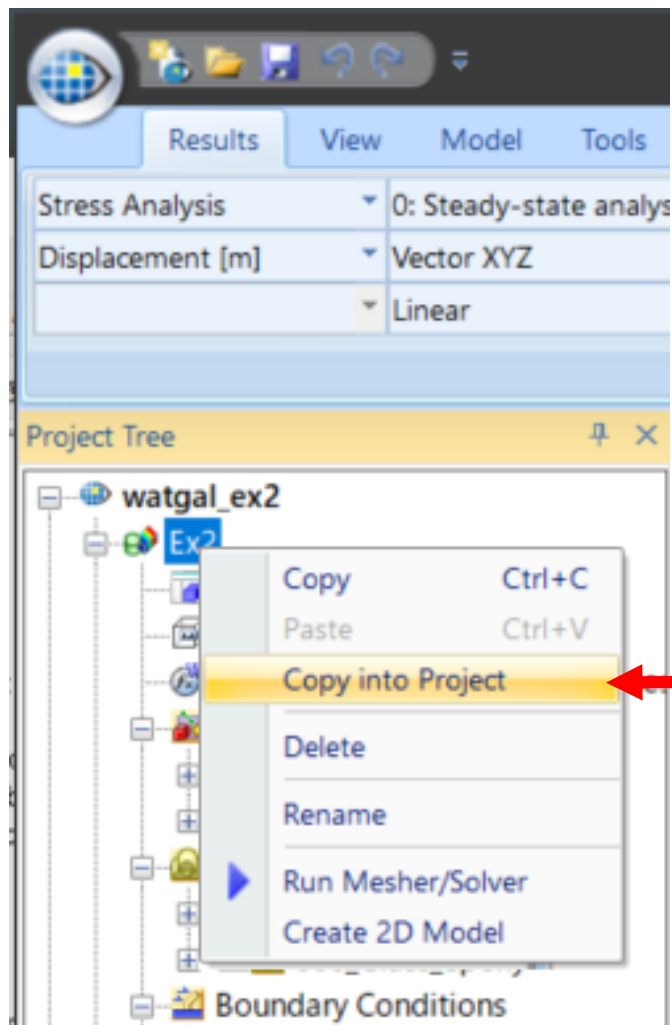
# Obtain Project File

Obtain a project file of Example 2 from  
Help > Examples > Thermal-Stress Analysis (Watt/Galileo) > Example 2



Run solver and confirm the results.

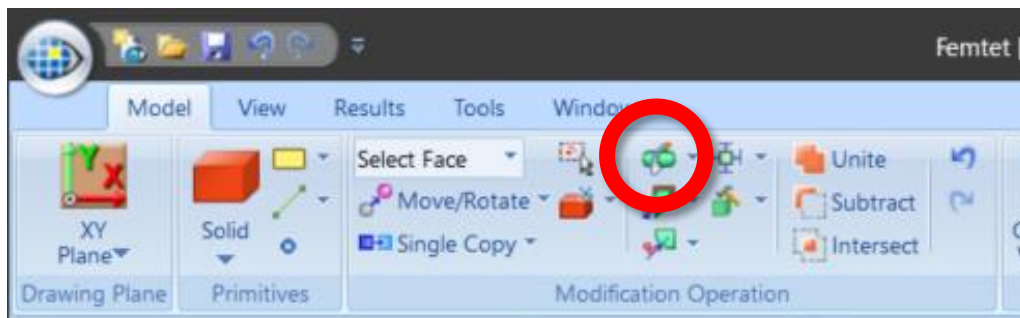
# Copy Analysis Model



Right-click on Model [Ex2].  
Select [Copy into Project].  
Save the file as [Ex2 symmetric model].

\*This is for results comparison at a later time.

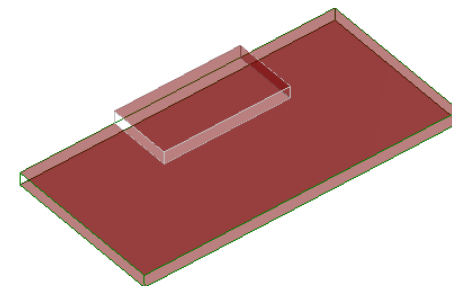
# Create a Symmetric Quarter Model (1)



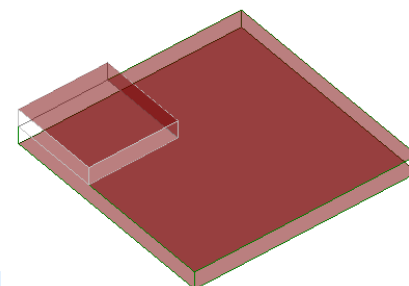
Point on the cutting plane: Origin (0, 0, 0)

Normal vector of the cutting plane (1, 0, 0)

Select [Keep bodies in the positive normal direction only]



全体寸法 : 50.00000000

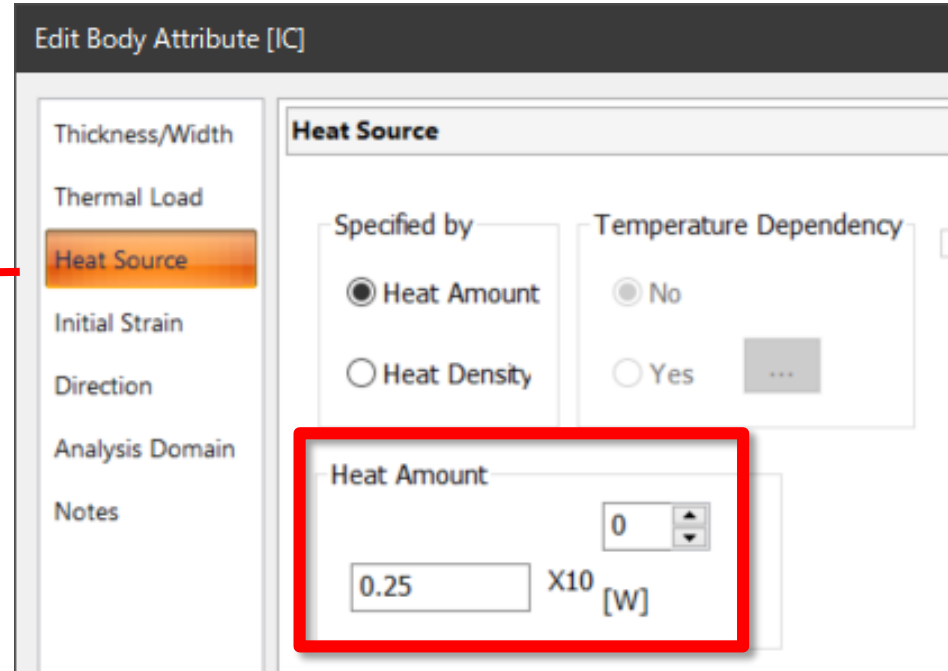
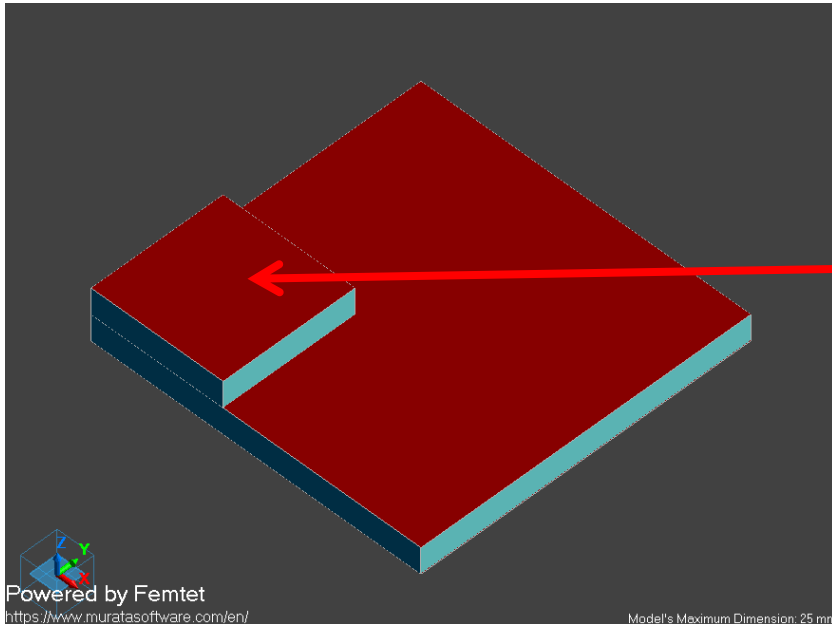


全体寸法 : 25.00000000

# Create a Symmetric Quarter Model (2)

Change the heat amount to a quarter of the full model (1→0.25W)

Heat Amount of IC

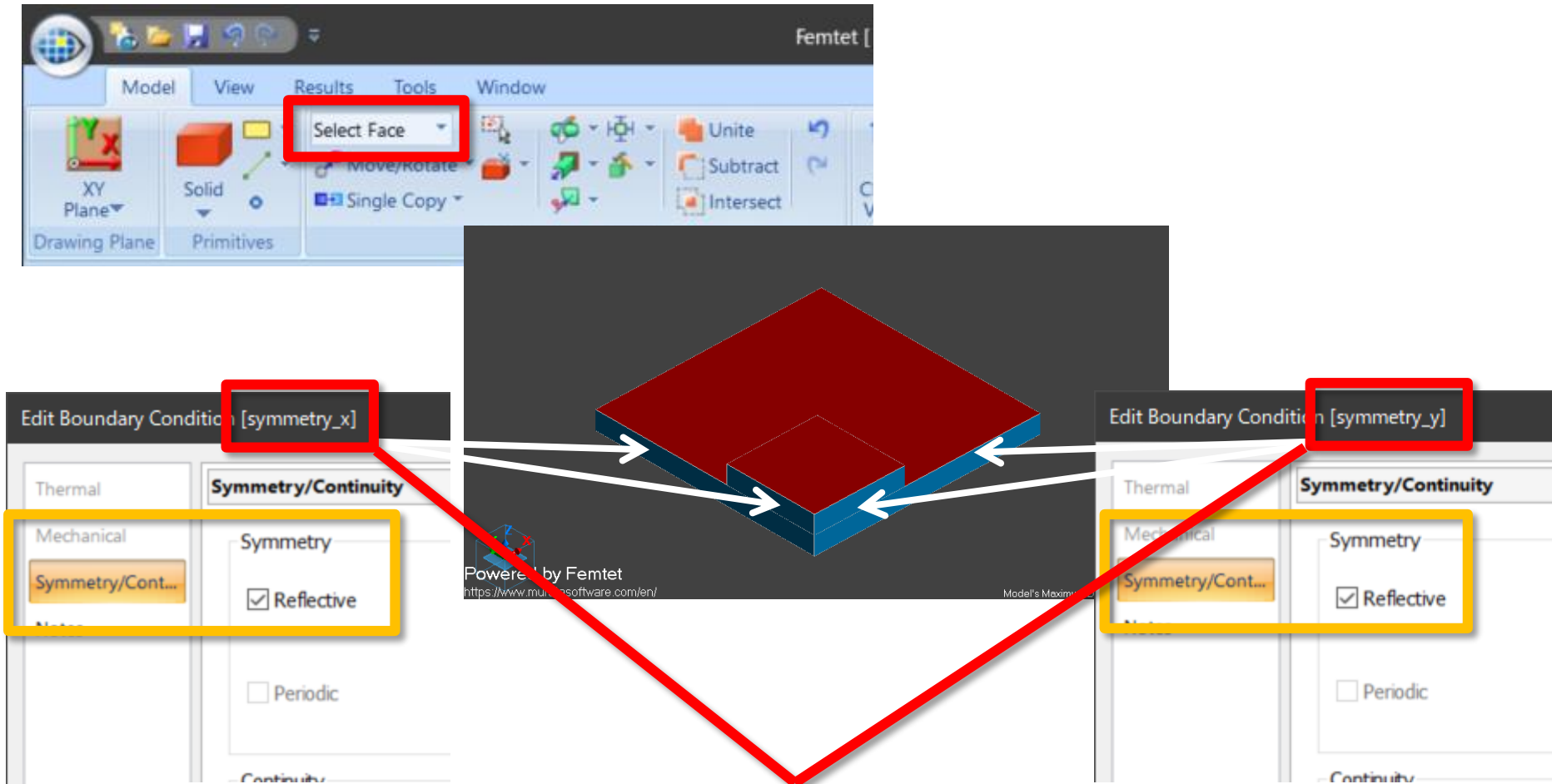


Overwrite the model and save

Enter 0.25[W]

# Create a Symmetric Quarter Model (3)

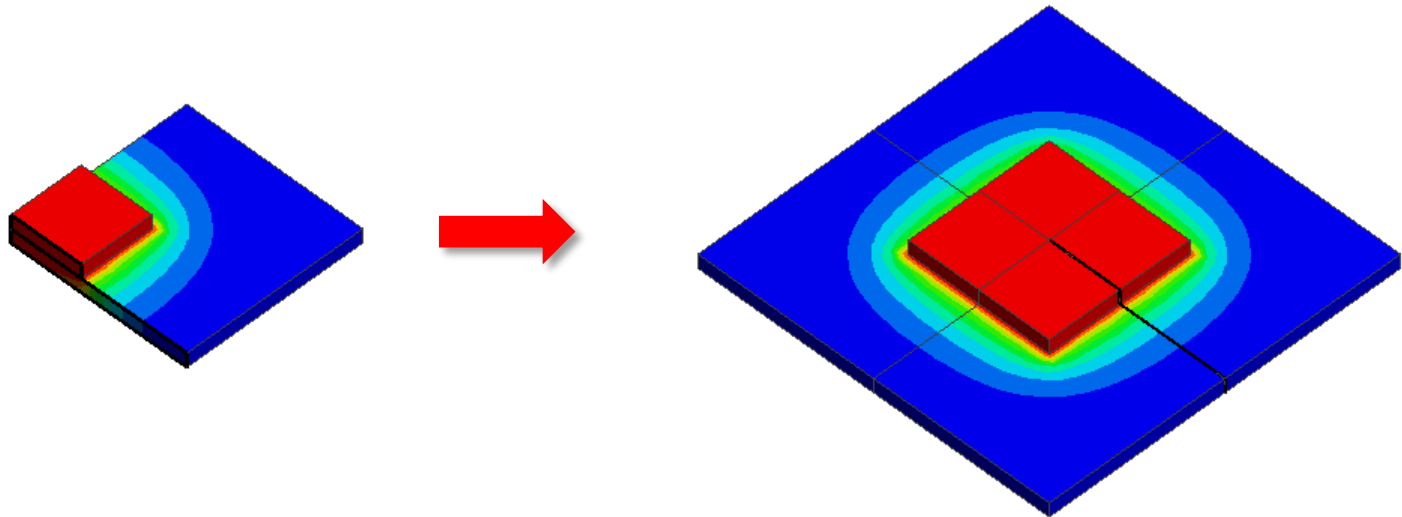
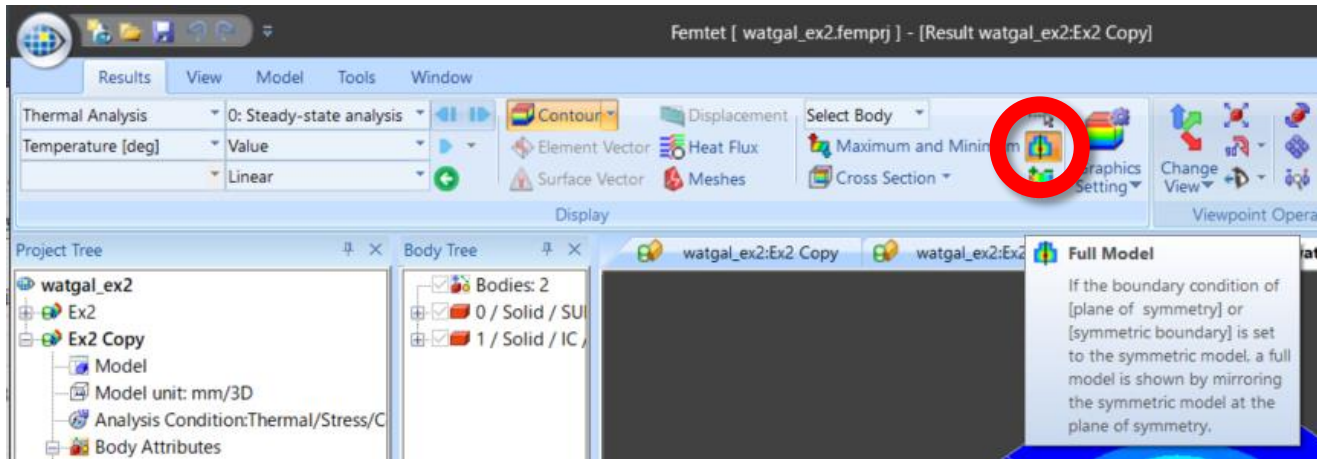
Boundary condition setting on the face of symmetry (Reflective symmetry)



If the direction of the faces of symmetry is different, the boundary condition must be set on each of them. The direction is either X, Y, or Z axis.

# Results of Quarter Model

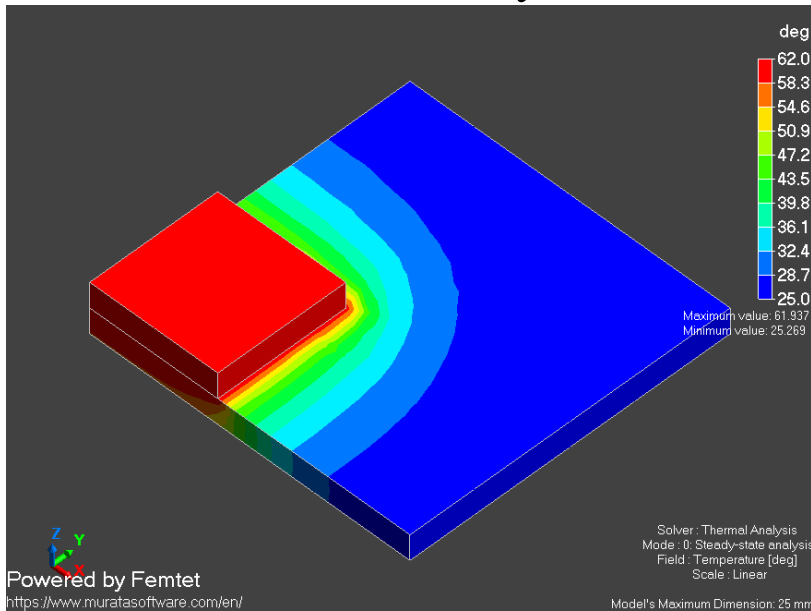
If [reflective symmetry] is used, the results can be confirmed with a full model.



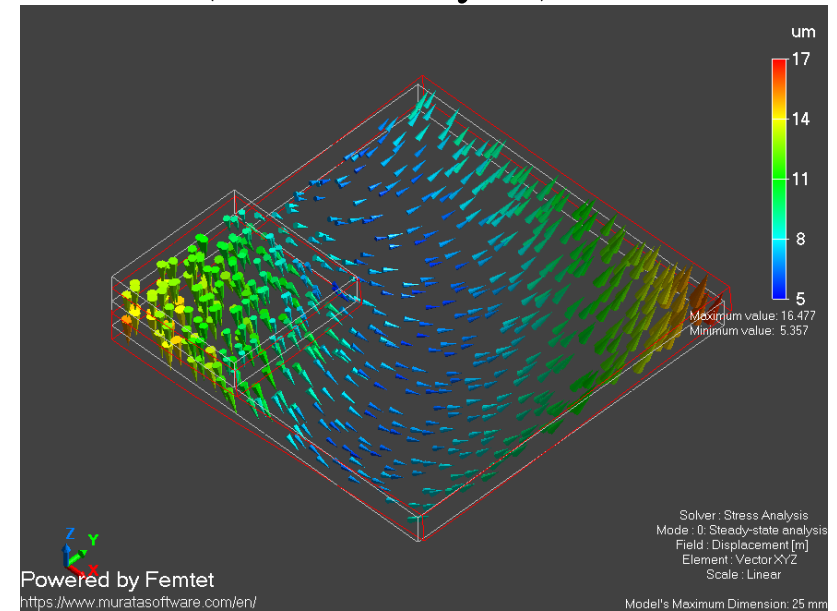


Check if the results match with the full model

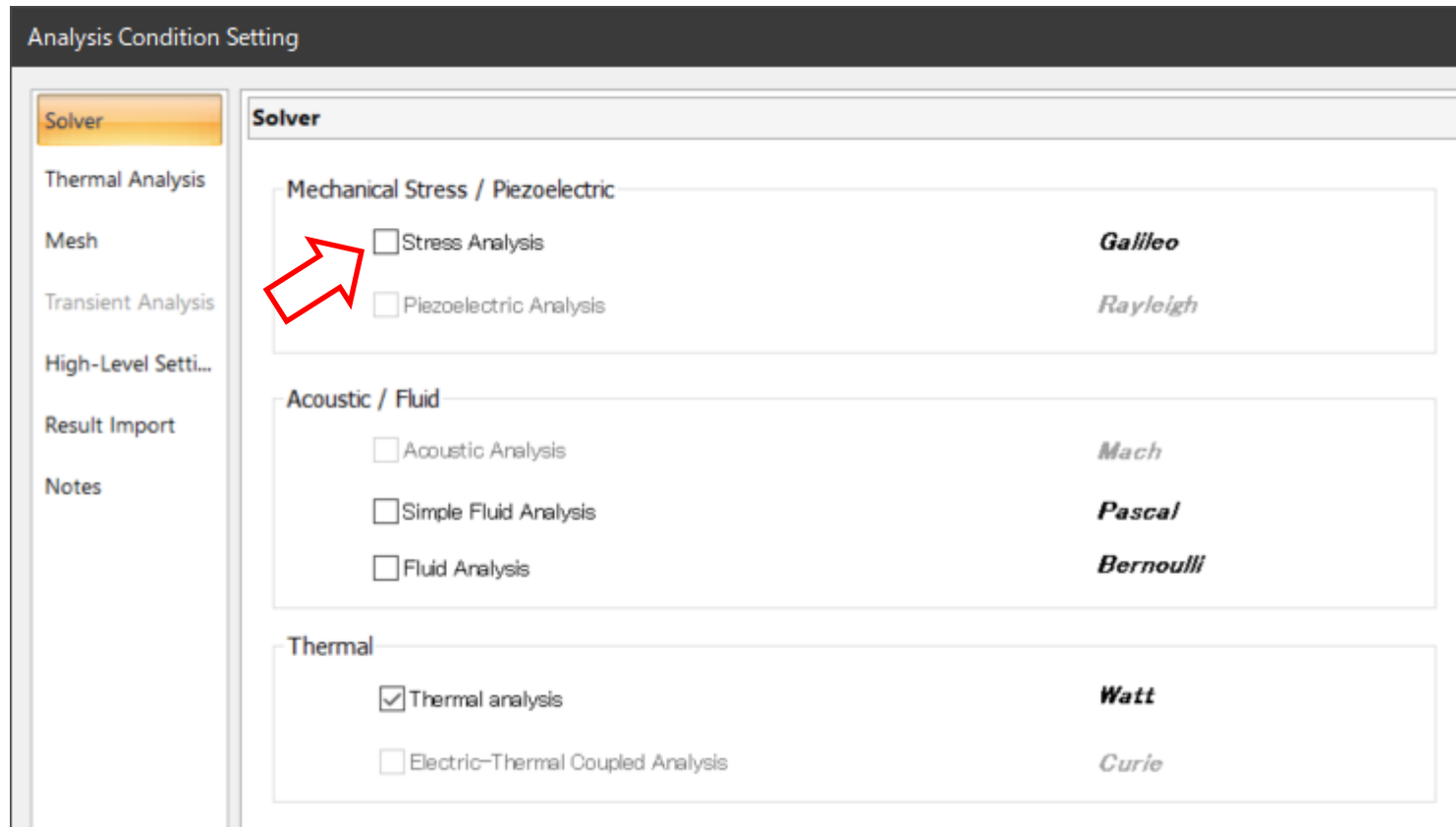
## Temperature Distribution (Thermal Analysis)



## Displacement Vectors (Stress Analysis)

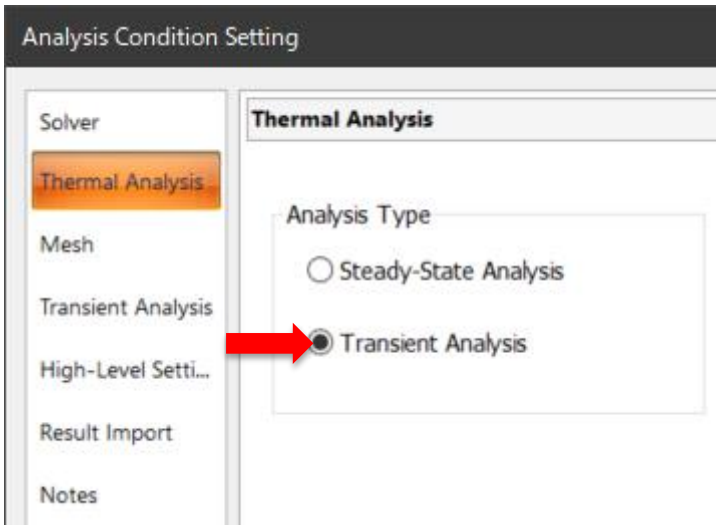


Deselect [Stress Analysis] to save calculation time.



# Transient Analysis

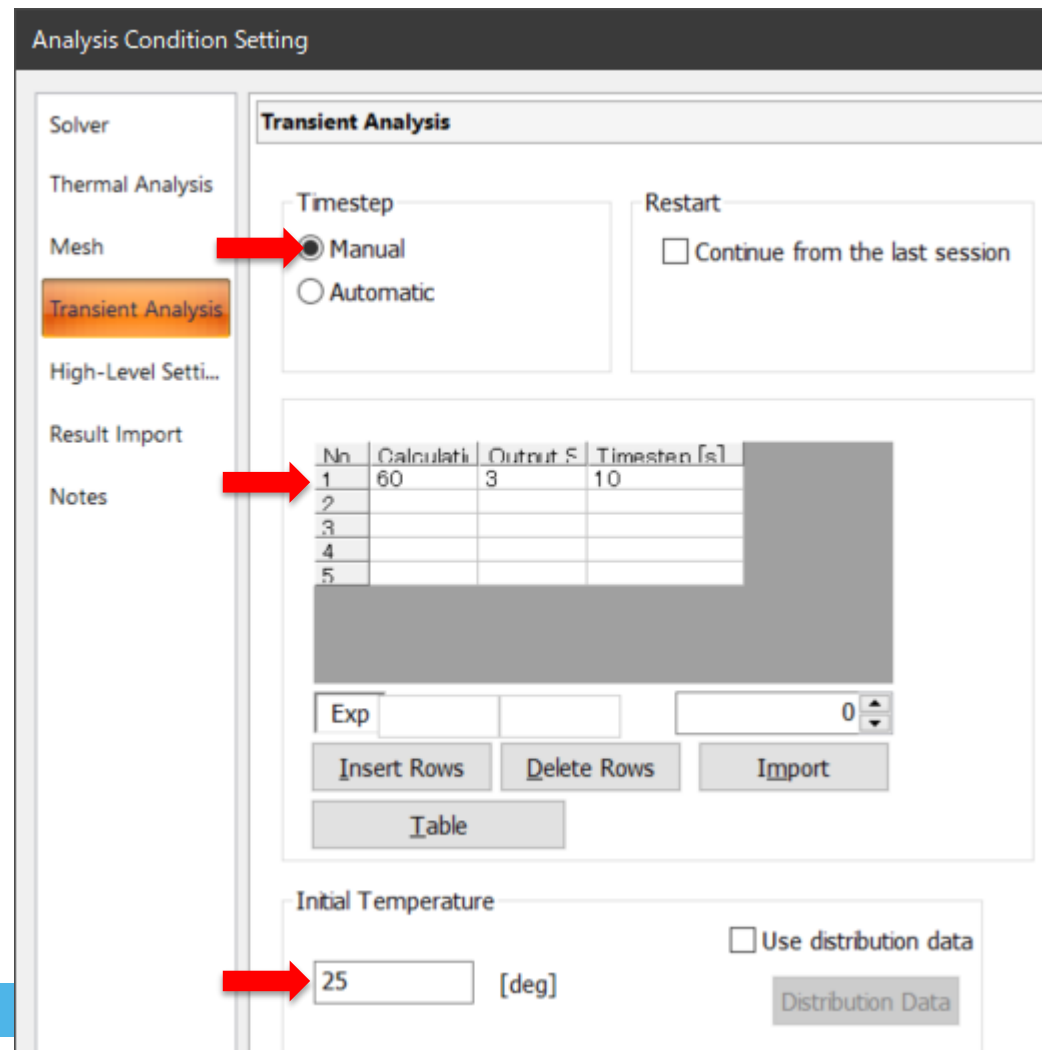
## Select [Transient Analysis]



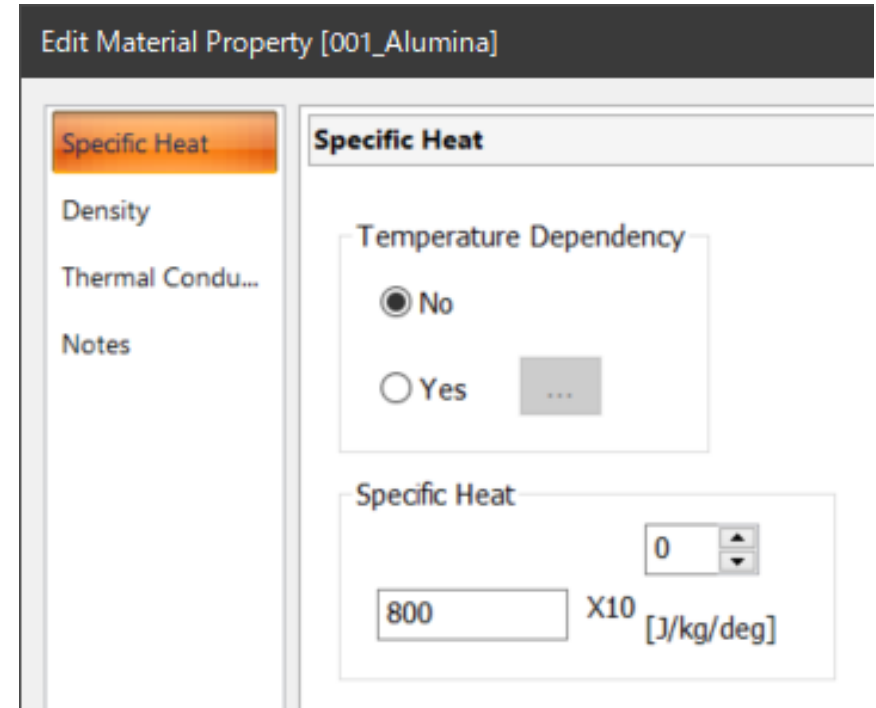
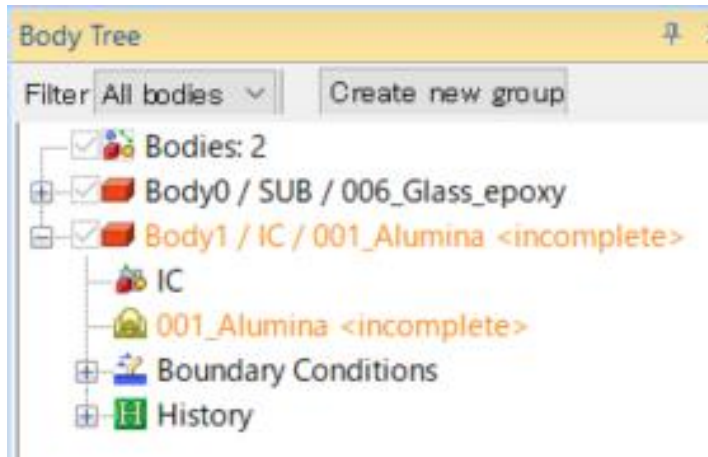
The analysis is performed for 600 seconds (=10s x 60)  
The result is output once in 3 calculations\*

\*The results file size will be small.

## Settings on the Transient Analysis tab



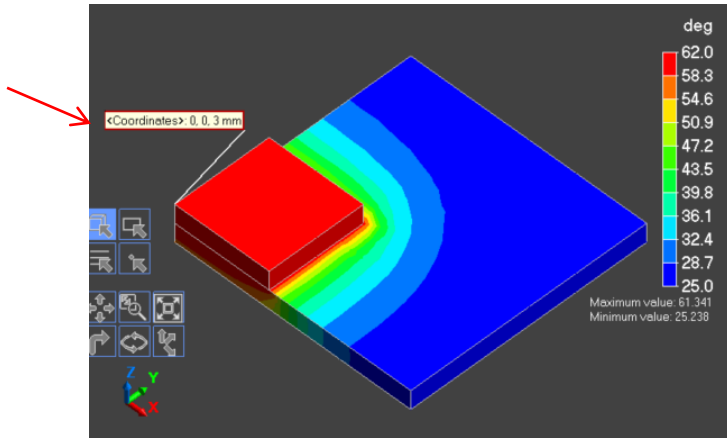
# Transient Analysis



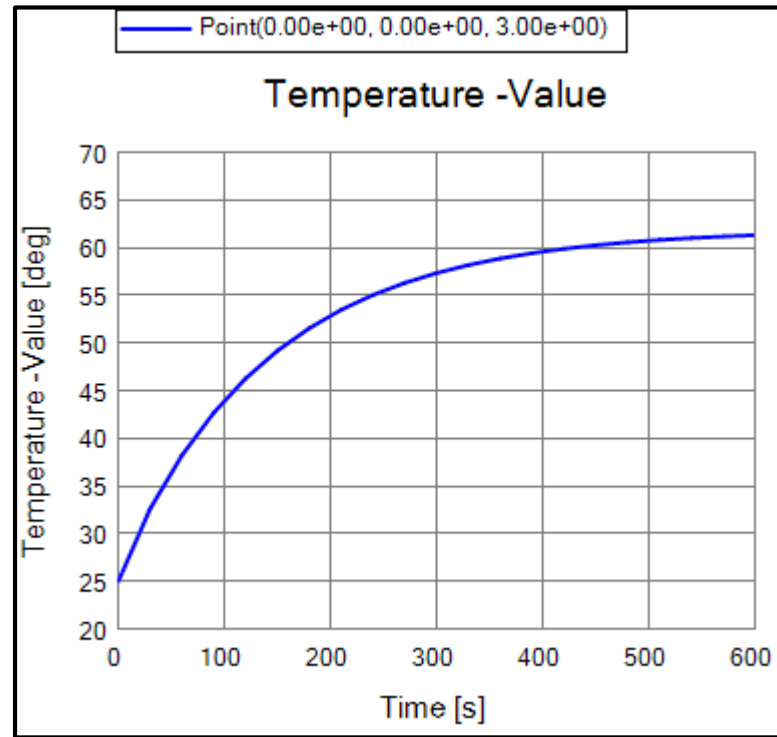
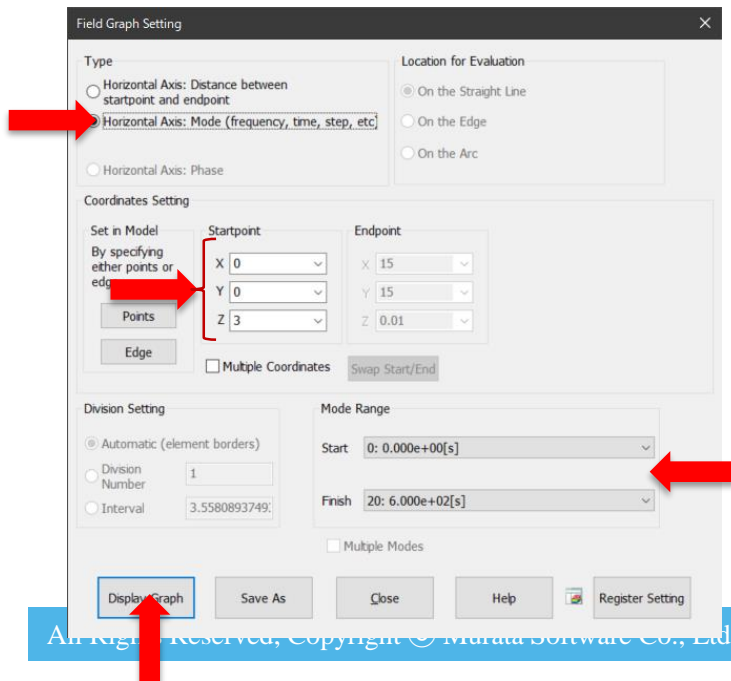
[Incomplete] shows up as the specific heat is not defined for the material property.

Set specific heat of 800J/kg/deg to Alumina.

# Transient Analysis



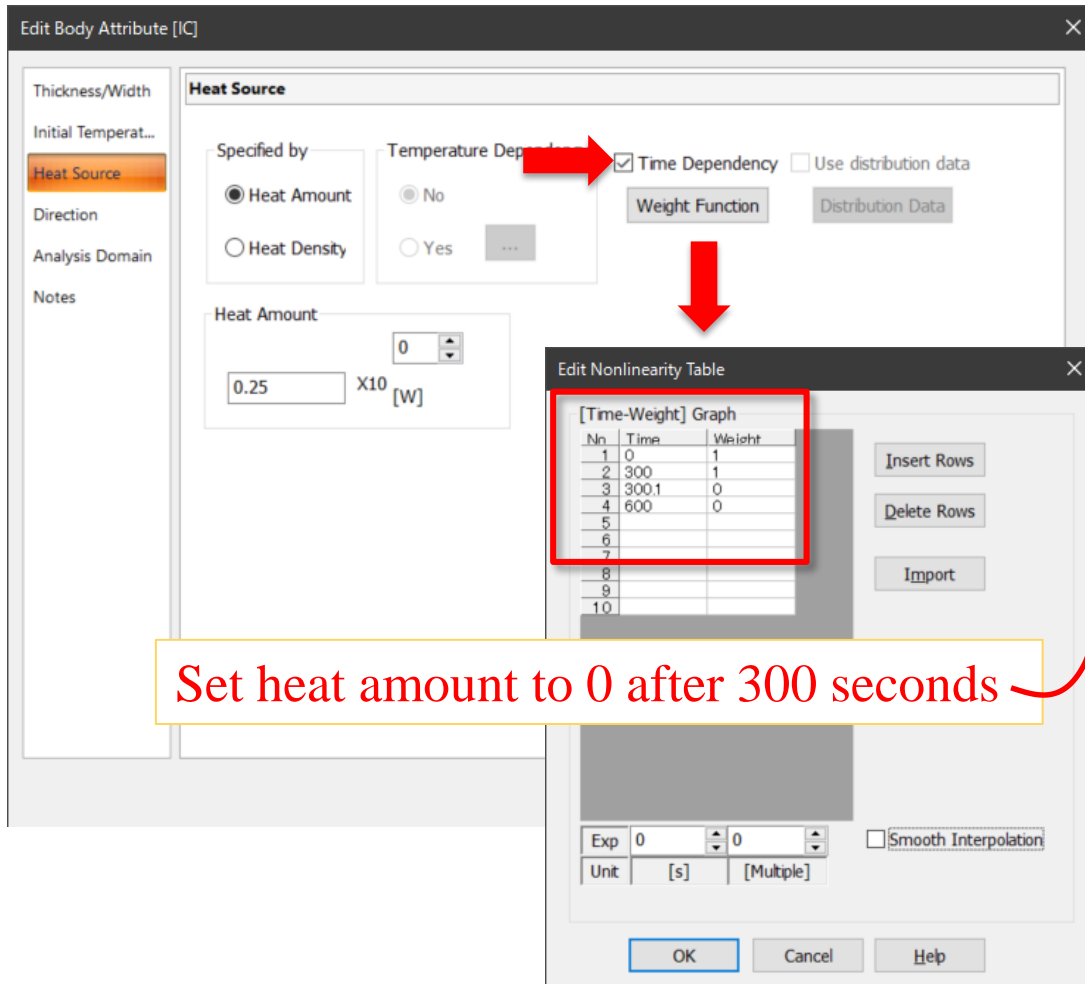
Contour of Temperature at 600s (watt)



Temperature over the heat source is plotted with time on the horizontal axis. It reaches the steady state at 600 seconds.

\*Graph can be made from the numerical summary table as well.

Set time dependency to the heat source.



Heat Source

Specified by:  Time Dependency  Use distribution data

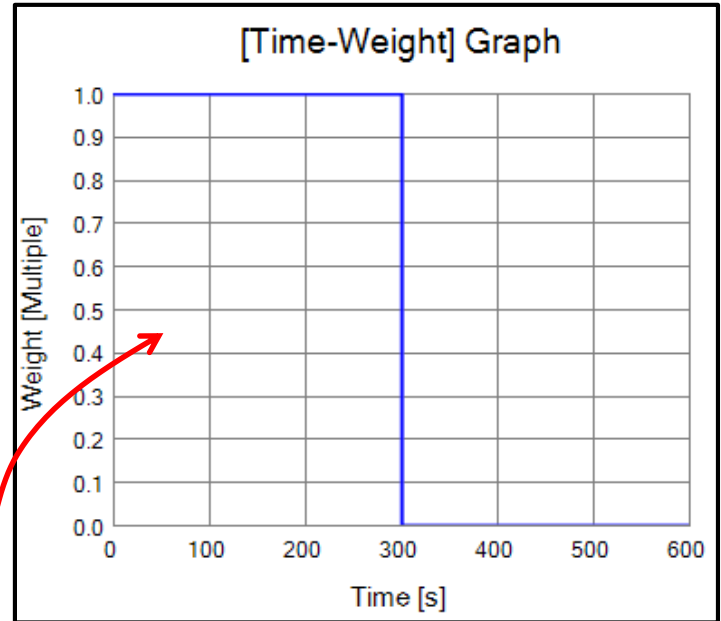
Temperature Dependency:  No  Yes

Heat Amount: 0.25 X10 [W]

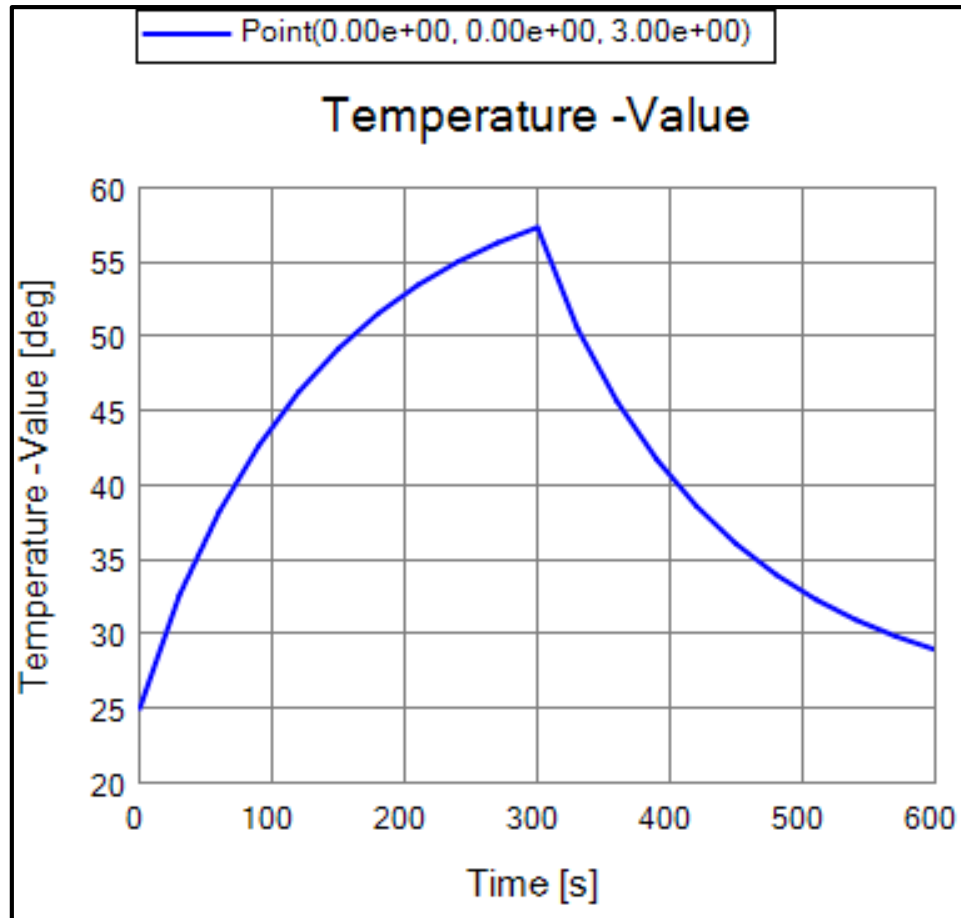
No.	Time	Weight
1	0	1
2	300	1
3	300.1	0
4	600	0
5		
6		
7		
8		
9		
10		

Exp 0 Unit [s]

Smooth Interpolation



Set heat amount to 0 after 300 seconds



After 300 seconds, the temperature falls down.

\*Graph can be made from the numerical summary table as well.