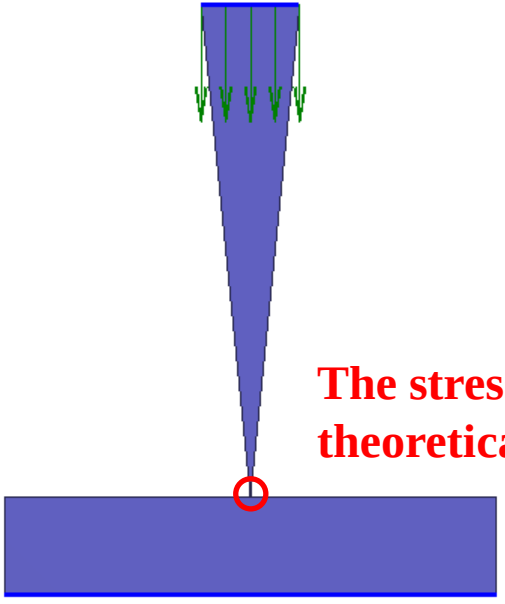
# Question 6

**Q**: Why does stress become highly concentrated or localized at a certain portion of a model?

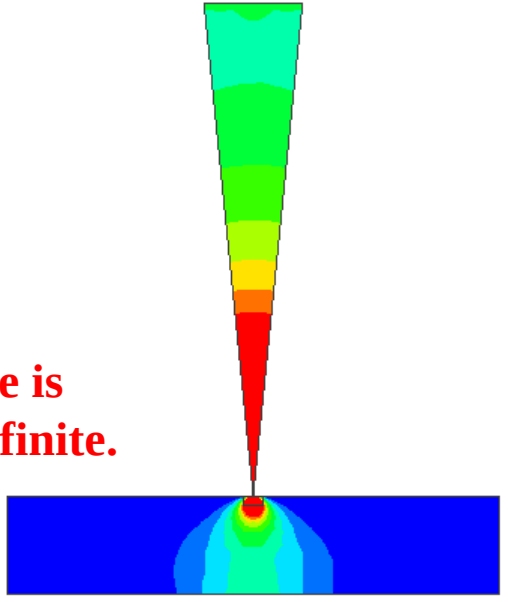
**A**: In stress analysis, a stress of infinite value is theoretically generated in a certain portion, such as the base of a cantilever, according to the model shape.
This portion is called a stress singularity. The stress at the singularity point will not converge to a constant value even with smaller-sized meshes. The stress around the singularity point does not have sufficient accuracy. For better accuracy, refer stress at the portion several meshes away from the singularity point or modify the model shape by introducing fillets or chamfers.

Please refer to the next slides to handle singularity points properly.

# Stress Singularity Point



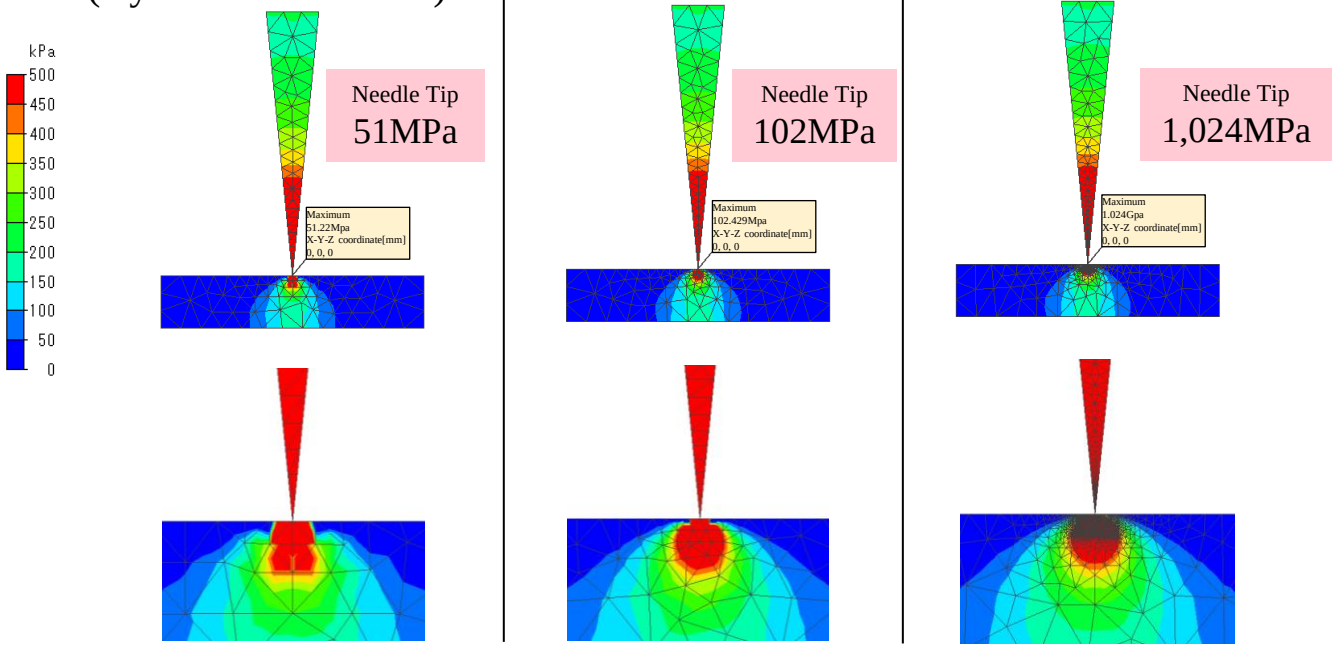
**The stress value is theoretically infinite.**



# Stress Singularity Point

Murata Software

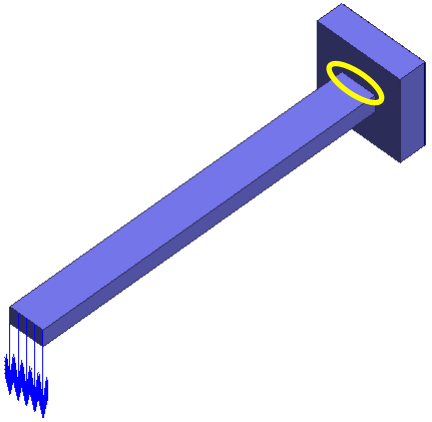
Stress (Hydrostatic Pressure)




The stress at the singularity point will not converge to a constant value even with smaller-sized meshes; It will approach infinity, the theoretical value.
The stress value at the portion two meshes away from the singularity point is trustworthy.

# Stress Singularity Point

Murata Software



In the model above, the base of the cantilever may become a singularity point.
(Rounding the base will eliminate a singularity point)

Singularity points are not uncommon.
If a portion with concentrated strain is not rounded, it can become a singularity point.
When stress values do not converge even with smaller-sized meshes, the portion can probably be a singularity point.

# Stress Singularity Point

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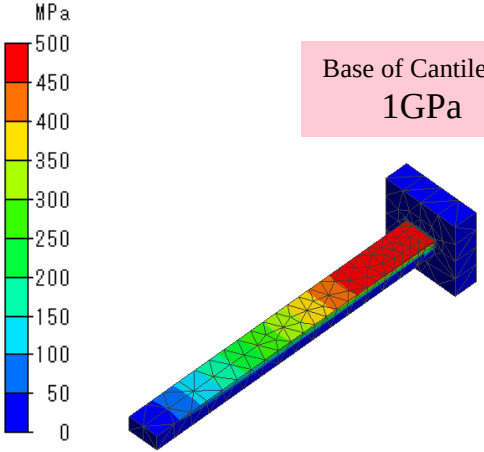
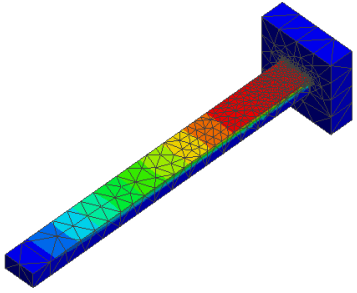
Stress (Maximum Principal Stress)



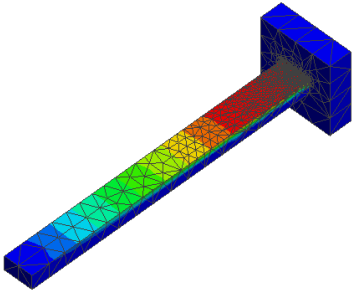

Base of Cantilever
1GPa



Base of Cantilever
1.3GPa



Base of Cantilever
2.1GPa



The stress at the singularity point will not converge to a constant value even with smaller-sized meshes; It will approach infinity, the theoretical value.
The stress value at the portion two meshes away from the singularity is trustworthy.

# Stress Singularity Point

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How to cope with singularity issues

(1) Remove the data of portions around the singularity point from the data of your interest.

(2) Make the model rounded to eliminate a singularity point.

(3) Adjust mesh sizes to a certain size to compare levels between varied structural parameters.
(It is assumed that the varied models with the same mesh size will maintain the relative relation between their resultant levels even though the values of the analysis values around the singularity point can not be trusted as absolute values.)

How to evaluate crack or fissure propagation

Use strain energy release rate for evaluation.

Please refer to the help menu below for further information.
*Home>Technical Notes>Stress Analysis>J Integral*.