

# Question 11

**Q:** How to perform the piezoelectric-harmonic analysis with viscoelasticity taken into account?

**A:** The dynamic modulus of a material is used to perform the analysis with viscoelasticity taken into account.

When viscoelasticity is taken into account, the material is treated as an isotropic material during calculations. To calculate the transverse modulus or shear modulus for the analysis, Poisson's ratio specified on the [Piezoelectricity] tab will be used.

Please refer to the next slide.

# Additional Information

The piezoelectric-harmonic analysis can take into account viscoelasticity.

The dynamic modulus of a material is used to perform the analysis with viscoelasticity taken into account.

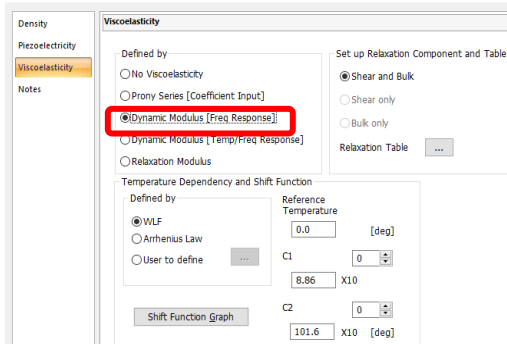
$$D^* = D(1 + j \tan \delta) = D_{re} + j D_{im}$$

$D^*$ :Dynamic modulus,  $D_{re}$ :Storage modulus,  $D_{im}$ :Loss modulus

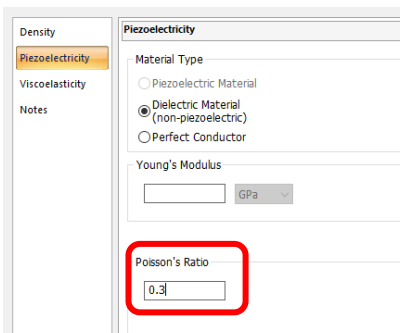
When viscoelasticity is taken into account, the material is treated as an isotropic material during calculations.

To calculate the transverse modulus or shear modulus for the analysis, Poisson's ratio specified on the [Piezoelectricity] tab will be used.

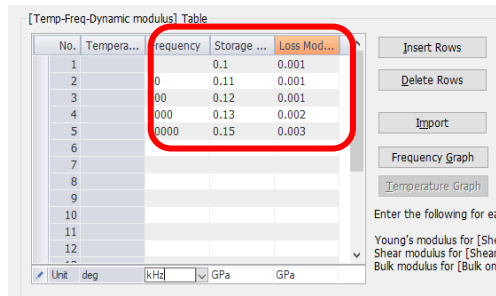
Edit Material Property [000\_P-4 From material database]



Edit Material Property [000\_P-4 From material database]



Edit Viscoelasticity Table



No.	Tempera...	frequency	Storage ...	Loss Mod...
1			0.1	0.001
2		0	0.11	0.001
3		00	0.12	0.001
4		000	0.13	0.002
5		0000	0.15	0.003
6				
7				
8				
9				
10				
11				
12				

Enter the following for ea  
Young's modulus for [She  
Shear modulus for [Shear  
Bulk modulus for [Bulk on