

MPG No. 6.3.19 2'2'2 (2'2'2 setting) [Type III, orthorhombic] [T tensor]

* Rank 0 tensor. * Rank 1 tensor.

$$[0 \ 0 \ T_z]$$

$$T_z = T_{pz}^{(1)}$$

* Rank 2 tensor (s).

$$\begin{bmatrix} 0 & T_{xy} & 0 \\ T_{xy} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$T_{xy} = T_{dxy}^{(1)}$$

* Rank 2 tensor (a).

$$\begin{bmatrix} 0 & T_{xy} & 0 \\ -T_{xy} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$T_{xy} = M_{pz}^{(1)}$$

* Rank 3 tensor (s).

$$\begin{bmatrix} 0 & 0 & T_{xxz} \\ 0 & 0 & T_{yyz} \\ 0 & 0 & T_{zzz} \\ 0 & T_{yzy} & 0 \\ T_{zxz} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$T_{xxz} = -2M_{dxy}^{(1)} - T_{faz}^{(1)} + T_{fbz}^{(1)} + T_{pz}^{(1)}$$

$$T_{yyz} = 2M_{dxy}^{(1)} - T_{faz}^{(1)} - T_{fbz}^{(1)} + T_{pz}^{(1)}$$

$$T_{zzz} = 2T_{faz}^{(1)} + T_{pz}^{(1)} + 2T_{pz}^{(2)}$$

$$T_{yzy} = -M_{dxy}^{(1)} - T_{faz}^{(1)} - T_{fbz}^{(1)} + T_{pz}^{(2)}$$

$$T_{zxz} = M_{dxy}^{(1)} - T_{faz}^{(1)} + T_{fbz}^{(1)} + T_{pz}^{(2)}$$

* Rank 3 tensor (a).

$$\begin{bmatrix} 0 & T_{yzy} & 0 \\ T_{zxz} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$T_{yzy} = M_{dxy}^{(2)} + T_{pz}^{(3)}$$

$$T_{zxz} = M_{dxy}^{(2)} - T_{pz}^{(3)}$$

* Rank 4 tensor (sss).

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & T_{xxxz} \\ 0 & 0 & 0 & 0 & 0 & T_{yyxy} \\ 0 & 0 & 0 & 0 & 0 & T_{zzxy} \\ 0 & 0 & 0 & 0 & T_{yzzx} & 0 \\ 0 & 0 & 0 & T_{yzzx} & 0 & 0 \\ T_{xxxz} & T_{yyxy} & T_{zzxy} & 0 & 0 & 0 \end{bmatrix}$$

$$T_{xxxy} = T_{dxy}^{(1)} + 2T_{dxy}^{(2)} + T_{gaz}^{(1)} - T_{gbz}^{(1)}$$

$$T_{yyxy} = T_{dxy}^{(1)} + 2T_{dxy}^{(2)} - T_{gaz}^{(1)} - T_{gbz}^{(1)}$$

$$T_{zzxy} = T_{dxy}^{(1)} + 2T_{gbz}^{(1)}$$

$$T_{yzzx} = T_{dxy}^{(2)} + 2T_{gbz}^{(1)}$$

* Rank 4 tensor (ssa).

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & T_{xxxy} \\ 0 & 0 & 0 & 0 & 0 & T_{yyxy} \\ 0 & 0 & 0 & 0 & 0 & T_{zzxy} \\ 0 & 0 & 0 & 0 & T_{yzzx} & 0 \\ 0 & 0 & 0 & -T_{yzzx} & 0 & 0 \\ -T_{xxxy} & -T_{yyxy} & -T_{zzxy} & 0 & 0 & 0 \end{bmatrix}$$

$$T_{xxxy} = -2M_{faz}^{(1)} + 2M_{fbz}^{(1)} + 2M_{pz}^{(1)} + T_{dxy}^{(3)}$$

$$T_{yyxy} = 2M_{faz}^{(1)} + 2M_{fbz}^{(1)} - 2M_{pz}^{(1)} + T_{dxy}^{(3)}$$

$$T_{zzxy} = -4M_{fbz}^{(1)} + T_{dxy}^{(3)}$$

$$T_{yzzx} = -4M_{faz}^{(1)} - M_{pz}^{(1)}$$

* Rank 4 tensor (aas).

$$\begin{bmatrix} 0 & T_{yzzx} & 0 \\ T_{yzzx} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$T_{yzzx} = 2T_{dxy}^{(4)}$$

* Rank 4 tensor (aaa).

$$\begin{bmatrix} 0 & T_{yzzx} & 0 \\ -T_{yzzx} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$T_{yzzx} = -M_{pz}^{(2)}$$

* Rank 4 tensor (sa).

$$\begin{bmatrix} 0 & 0 & T_{xxxy} \\ 0 & 0 & T_{yyxy} \\ 0 & 0 & T_{zzxy} \\ 0 & T_{yzzx} & 0 \\ T_{zxyz} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$T_{xxxy} = -M_{faz}^{(2)} + M_{fbz}^{(2)} + M_{pz}^{(3)} - 2T_{dxy}^{(5)}$$

$$T_{yyxy} = -M_{faz}^{(2)} - M_{fbz}^{(2)} + M_{pz}^{(3)} + 2T_{dxy}^{(5)}$$

$$T_{zzxy} = 2M_{faz}^{(2)} + M_{pz}^{(3)} + 2M_{pz}^{(4)}$$

$$T_{yzzx} = -M_{faz}^{(2)} - M_{fbz}^{(2)} + M_{pz}^{(4)} - T_{dxy}^{(5)}$$

$$T_{zxyz} = -M_{faz}^{(2)} + M_{fbz}^{(2)} + M_{pz}^{(4)} + T_{dxy}^{(5)}$$

* Rank 4 tensor (as).

$$\begin{bmatrix} 0 & 0 & 0 & 0 & T_{yzzx} & 0 \\ 0 & 0 & 0 & T_{zxyz} & 0 & 0 \\ T_{xyxx} & T_{xyyy} & T_{xyzz} & 0 & 0 & 0 \end{bmatrix}$$

$$\begin{aligned}
T_{yzzx} &= -M_{faz}^{(3)} + M_{fbz}^{(3)} + M_{pz}^{(6)} + T_{dxy}^{(6)} \\
T_{zxyz} &= -M_{faz}^{(3)} - M_{fbz}^{(3)} + M_{pz}^{(6)} - T_{dxy}^{(6)} \\
T_{xyxx} &= -M_{faz}^{(3)} + M_{fbz}^{(3)} + M_{pz}^{(5)} - 2T_{dxy}^{(6)} \\
T_{xyyy} &= -M_{faz}^{(3)} - M_{fbz}^{(3)} + M_{pz}^{(5)} + 2T_{dxy}^{(6)} \\
T_{xyzz} &= 2M_{faz}^{(3)} + M_{pz}^{(5)} + 2M_{pz}^{(6)}
\end{aligned}$$

* Rank 4 tensor (s).

$$\begin{bmatrix}
0 & 0 & 0 & 0 & 0 & T_{xxx} & 0 & 0 & T_{xyx} \\
0 & 0 & 0 & 0 & 0 & T_{yyx} & 0 & 0 & T_{yyx} \\
0 & 0 & 0 & 0 & 0 & T_{zzy} & 0 & 0 & T_{zzy} \\
0 & 0 & 0 & 0 & T_{yzz} & 0 & 0 & T_{yzz} & 0 \\
0 & 0 & 0 & T_{xyz} & 0 & 0 & T_{zxz} & 0 & 0 \\
T_{xyxx} & T_{xyyy} & T_{xyzz} & 0 & 0 & 0 & 0 & 0 & 0
\end{bmatrix}$$

$$\begin{aligned}
T_{xxx} &= -2M_{faz}^{(1)} - M_{fbz}^{(2)} + 2M_{fbz}^{(1)} + M_{fbz}^{(2)} + 2M_{pz}^{(1)} + M_{pz}^{(3)} + T_{dxy}^{(1)} + 2T_{dxy}^{(2)} + T_{dxy}^{(3)} - 2T_{dxy}^{(5)} + T_{gaz}^{(1)} - T_{gbz}^{(1)} \\
T_{xyx} &= -2M_{faz}^{(1)} + M_{fbz}^{(2)} + 2M_{fbz}^{(1)} - M_{fbz}^{(2)} + 2M_{pz}^{(1)} - M_{pz}^{(3)} + T_{dxy}^{(1)} + 2T_{dxy}^{(2)} + T_{dxy}^{(3)} + 2T_{dxy}^{(5)} + T_{gaz}^{(1)} - T_{gbz}^{(1)} \\
T_{yyx} &= 2M_{faz}^{(1)} - M_{fbz}^{(2)} + 2M_{fbz}^{(1)} - M_{fbz}^{(2)} - 2M_{pz}^{(1)} + M_{pz}^{(3)} + T_{dxy}^{(1)} + 2T_{dxy}^{(2)} + T_{dxy}^{(3)} + 2T_{dxy}^{(5)} - T_{gaz}^{(1)} - T_{gbz}^{(1)} \\
T_{yyy} &= 2M_{faz}^{(1)} + M_{fbz}^{(2)} + 2M_{fbz}^{(1)} + M_{fbz}^{(2)} - 2M_{pz}^{(1)} - M_{pz}^{(3)} + T_{dxy}^{(1)} + 2T_{dxy}^{(2)} + T_{dxy}^{(3)} - 2T_{dxy}^{(5)} - T_{gaz}^{(1)} - T_{gbz}^{(1)} \\
T_{zzy} &= 2M_{faz}^{(2)} - 4M_{fbz}^{(1)} + M_{pz}^{(3)} + 2M_{pz}^{(4)} + T_{dxy}^{(1)} + T_{dxy}^{(3)} + 2T_{gbz}^{(1)} \\
T_{yzz} &= -2M_{faz}^{(2)} - 4M_{fbz}^{(1)} - M_{pz}^{(3)} - 2M_{pz}^{(4)} + T_{dxy}^{(1)} + T_{dxy}^{(3)} + 2T_{gbz}^{(1)} \\
T_{xyz} &= -4M_{faz}^{(1)} - M_{fbz}^{(2)} - M_{fbz}^{(1)} - M_{pz}^{(4)} + M_{pz}^{(2)} + T_{dxy}^{(2)} - T_{dxy}^{(5)} + 2T_{gbz}^{(1)} \\
T_{zxz} &= -4M_{faz}^{(1)} + M_{fbz}^{(2)} + M_{fbz}^{(1)} - M_{pz}^{(1)} - M_{pz}^{(4)} + T_{dxy}^{(2)} + T_{dxy}^{(5)} + 2T_{gbz}^{(1)} \\
T_{zxy} &= 4M_{faz}^{(1)} - M_{fbz}^{(2)} + M_{fbz}^{(1)} + M_{pz}^{(1)} + M_{pz}^{(4)} + T_{dxy}^{(2)} + T_{dxy}^{(5)} + 2T_{gbz}^{(1)} \\
T_{zxz} &= 4M_{faz}^{(1)} + M_{fbz}^{(2)} - M_{fbz}^{(1)} + M_{pz}^{(1)} - M_{pz}^{(4)} + T_{dxy}^{(2)} - T_{dxy}^{(5)} + 2T_{gbz}^{(1)} \\
T_{xyx} &= 2M_{faz}^{(1)} - 2M_{fbz}^{(2)} - 2M_{pz}^{(1)} + T_{dxy}^{(1)} + 2T_{dxy}^{(2)} - T_{dxy}^{(3)} + T_{gaz}^{(1)} - T_{gbz}^{(1)} \\
T_{xyy} &= -2M_{faz}^{(1)} - 2M_{fbz}^{(2)} + 2M_{pz}^{(1)} + T_{dxy}^{(1)} + 2T_{dxy}^{(2)} - T_{dxy}^{(3)} - T_{gaz}^{(1)} - T_{gbz}^{(1)} \\
T_{xyz} &= 4M_{fbz}^{(1)} + T_{dxy}^{(1)} - T_{dxy}^{(3)} + 2T_{gbz}^{(1)}
\end{aligned}$$

* Rank 4 tensor (a).

$$\begin{bmatrix}
0 & 0 & 0 & 0 & T_{yzz} & 0 & 0 & T_{yzz} & 0 \\
0 & 0 & 0 & T_{xyz} & 0 & 0 & T_{zxz} & 0 & 0 \\
T_{xyxx} & T_{xyyy} & T_{xyzz} & 0 & 0 & 0 & 0 & 0 & 0
\end{bmatrix}$$

$$\begin{aligned}
T_{yzz} &= -M_{faz}^{(3)} + M_{fbz}^{(3)} - M_{pz}^{(2)} + M_{pz}^{(6)} + 2T_{dxy}^{(4)} + T_{dxy}^{(6)} \\
T_{yzz} &= -M_{faz}^{(3)} + M_{fbz}^{(3)} + M_{pz}^{(2)} + M_{pz}^{(6)} - 2T_{dxy}^{(4)} + T_{dxy}^{(6)} \\
T_{zxy} &= -M_{faz}^{(3)} - M_{fbz}^{(3)} + M_{pz}^{(2)} + M_{pz}^{(6)} + 2T_{dxy}^{(4)} - T_{dxy}^{(6)} \\
T_{zxz} &= -M_{faz}^{(3)} - M_{fbz}^{(3)} - M_{pz}^{(2)} + M_{pz}^{(6)} - 2T_{dxy}^{(4)} - T_{dxy}^{(6)} \\
T_{xyx} &= -M_{faz}^{(3)} + M_{fbz}^{(3)} + M_{pz}^{(5)} - 2T_{dxy}^{(6)} \\
T_{xyy} &= -M_{faz}^{(3)} - M_{fbz}^{(3)} + M_{pz}^{(5)} + 2T_{dxy}^{(6)} \\
T_{xyz} &= 2M_{faz}^{(3)} + M_{pz}^{(5)} + 2M_{pz}^{(6)}
\end{aligned}$$

* Rank 4 tensor (t).

$$\begin{bmatrix} 0 & T_{xxyy} & 0 \\ T_{yyyx} & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & T_{zzxy} & 0 \\ T_{xxyx} & 0 & 0 \\ T_{yzxx} & 0 & 0 \\ 0 & 0 & 0 \\ 0 & T_{xyyy} & 0 \\ 0 & 0 & \frac{T_{xxxx}}{2} - \frac{T_{xxyx}}{2} + T_{xyyy} - T_{yyyx} + T_{zzxy} \end{bmatrix}$$

$$T_{xxxx} = T_{dxy}^{(1)} + 2T_{dxy}^{(2)} + T_{dxy}^{(3)} - 2T_{dxy}^{(5)} + T_{gaz}^{(1)} - T_{gbz}^{(1)}$$

$$T_{yyyx} = T_{dxy}^{(1)} + 2T_{dxy}^{(2)} + T_{dxy}^{(3)} - 2T_{dxy}^{(5)} - T_{gaz}^{(1)} - T_{gbz}^{(1)}$$

$$T_{zzxy} = T_{dxy}^{(1)} + T_{dxy}^{(3)} + 2T_{gbz}^{(1)}$$

$$T_{xxyx} = T_{dxy}^{(1)} + 2T_{dxy}^{(2)} + T_{dxy}^{(3)} + 2T_{dxy}^{(5)} + T_{gaz}^{(1)} - T_{gbz}^{(1)}$$

$$T_{yzxx} = T_{dxy}^{(2)} - T_{dxy}^{(5)} + 2T_{gbz}^{(1)}$$

$$T_{xyyy} = T_{dxy}^{(1)} + 2T_{dxy}^{(2)} - T_{dxy}^{(3)} - T_{gaz}^{(1)} - T_{gbz}^{(1)}$$