

MPG No. 4.1.9  $m$  [ Type I, monoclinic ] [Q tensor]

\* Rank 0 tensor.

$$[Q]$$

$$Q = Q_s^{(1)}$$

\* Rank 1 tensor.

$$[Q_x \quad 0 \quad Q_z]$$

$$\begin{aligned} Q_x &= Q_{px}^{(1)} \\ Q_z &= Q_{pz}^{(1)} \end{aligned}$$

\* Rank 2 tensor (s).

$$\begin{bmatrix} Q_{xx} & 0 & Q_{xz} \\ 0 & Q_{yy} & 0 \\ Q_{xz} & 0 & Q_{zz} \end{bmatrix}$$

$$Q_{xx} = -Q_{du}^{(1)} + Q_{dv}^{(1)} + Q_s^{(1)}$$

$$Q_{xz} = Q_{dxz}^{(1)}$$

$$Q_{yy} = -Q_{du}^{(1)} - Q_{dv}^{(1)} + Q_s^{(1)}$$

$$Q_{zz} = 2Q_{du}^{(1)} + Q_s^{(1)}$$

\* Rank 2 tensor (a).

$$\begin{bmatrix} 0 & 0 & Q_{xz} \\ 0 & 0 & 0 \\ -Q_{xz} & 0 & 0 \end{bmatrix}$$

$$Q_{xz} = -G_{py}^{(1)}$$

\* Rank 3 tensor (s).

$$\begin{bmatrix} Q_{xxx} & 0 & Q_{xxz} \\ Q_{yyx} & 0 & Q_{yyz} \\ Q_{zzx} & 0 & Q_{zzz} \\ 0 & Q_{yzy} & 0 \\ Q_{zxx} & 0 & Q_{zxx} \\ 0 & Q_{xyy} & 0 \end{bmatrix}$$

$$Q_{xxx} = 2Q_{fax}^{(1)} + Q_{px}^{(1)} + 2Q_{px}^{(2)}$$

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

$$Q_{yyx} = -2G_{dyz}^{(1)} - Q_{fax}^{(1)} + Q_{fbx}^{(1)} + Q_{px}^{(1)}$$

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

$$Q_{zzx} = 2G_{dyz}^{(1)} - Q_{fax}^{(1)} - Q_{fbx}^{(1)} + Q_{px}^{(1)}$$

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

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

$$Q_{zxx} = G_{dxy}^{(1)} - Q_{faz}^{(1)} + Q_{fbz}^{(1)} + Q_{pz}^{(2)}$$

$$Q_{zxx} = -G_{dyz}^{(1)} - Q_{fax}^{(1)} - Q_{fbx}^{(1)} + Q_{px}^{(2)}$$

$$Q_{xyy} = G_{dyz}^{(1)} - Q_{fax}^{(1)} + Q_{fbx}^{(1)} + Q_{px}^{(2)}$$

\* Rank 3 tensor (a).

$$\begin{bmatrix} 0 & Q_{yzy} & 0 \\ Q_{zxx} & 0 & Q_{zzx} \\ 0 & Q_{xyy} & 0 \end{bmatrix}$$

$$Q_{yzy} = G_{dxy}^{(2)} + Q_{pz}^{(3)}$$

$$Q_{zxx} = G_{dxy}^{(2)} - Q_{pz}^{(3)}$$

$$Q_{zzx} = G_{dyz}^{(2)} + Q_{px}^{(3)}$$

$$Q_{xyy} = G_{dyz}^{(2)} - Q_{px}^{(3)}$$

\* Rank 4 tensor (sss).

$$\begin{bmatrix} Q_{xxxx} & Q_{xxyy} & Q_{xxzz} & 0 & Q_{xxzx} & 0 \\ Q_{xxyy} & Q_{yyyy} & Q_{yyzz} & 0 & Q_{yyzx} & 0 \\ Q_{xxzz} & Q_{yyzz} & Q_{zzzz} & 0 & Q_{zzzx} & 0 \\ 0 & 0 & 0 & Q_{yzyz} & 0 & Q_{yzxy} \\ Q_{xxzx} & Q_{yyzx} & Q_{zzzx} & 0 & Q_{zxzx} & 0 \\ 0 & 0 & 0 & Q_{yzxy} & 0 & Q_{xyxy} \end{bmatrix}$$

$$Q_{xxxx} = -2Q_{du}^{(1)} - 4Q_{du}^{(2)} + 2Q_{dv}^{(1)} + 4Q_{dv}^{(2)} - Q_{gu}^{(1)} + Q_{gv}^{(1)} + 2Q_g^{(1)} + Q_s^{(1)} + 2Q_s^{(2)}$$

$$Q_{xxyy} = -2Q_{du}^{(1)} + 2Q_{gu}^{(1)} - Q_g^{(1)} + Q_s^{(1)}$$

$$Q_{xxzz} = Q_{du}^{(1)} + Q_{dv}^{(1)} - Q_{gu}^{(1)} - Q_{gv}^{(1)} - Q_g^{(1)} + Q_s^{(1)}$$

$$Q_{xxzx} = Q_{dxz}^{(1)} + 2Q_{dxxz}^{(2)} - Q_{gay}^{(1)} - Q_{gby}^{(1)}$$

$$Q_{yyyy} = -2Q_{du}^{(1)} - 4Q_{du}^{(2)} - 2Q_{dv}^{(1)} - 4Q_{dv}^{(2)} - Q_{gu}^{(1)} - Q_{gv}^{(1)} + 2Q_g^{(1)} + Q_s^{(1)} + 2Q_s^{(2)}$$

$$Q_{yyzz} = Q_{du}^{(1)} - Q_{dv}^{(1)} - Q_{gu}^{(1)} + Q_{gv}^{(1)} - Q_g^{(1)} + Q_s^{(1)}$$

$$Q_{yyzx} = Q_{dxz}^{(1)} + 2Q_{gby}^{(1)}$$

$$Q_{zzzz} = 4Q_{du}^{(1)} + 8Q_{du}^{(2)} + 2Q_{gu}^{(1)} + 2Q_g^{(1)} + Q_s^{(1)} + 2Q_s^{(2)}$$

$$Q_{zzzx} = Q_{dxz}^{(1)} + 2Q_{dxxz}^{(2)} + Q_{gay}^{(1)} - Q_{gby}^{(1)}$$

$$Q_{yzyz} = Q_{du}^{(2)} - Q_{dv}^{(2)} - Q_{gu}^{(1)} + Q_{gv}^{(1)} - Q_g^{(1)} + Q_s^{(2)}$$

$$Q_{yzxy} = Q_{dxz}^{(2)} + 2Q_{gby}^{(1)}$$

$$Q_{zxzx} = Q_{du}^{(2)} + Q_{dv}^{(2)} - Q_{gu}^{(1)} - Q_{gv}^{(1)} - Q_g^{(1)} + Q_s^{(2)}$$

$$Q_{xyxy} = -2Q_{du}^{(2)} + 2Q_{gu}^{(1)} - Q_g^{(1)} + Q_s^{(2)}$$

\* Rank 4 tensor (ssa).

$$\begin{bmatrix} 0 & Q_{xxyy} & Q_{xxzz} & 0 & Q_{xxzx} & 0 \\ -Q_{xxyy} & 0 & Q_{yyzz} & 0 & Q_{yyzx} & 0 \\ -Q_{xxzz} & -Q_{yyzz} & 0 & 0 & Q_{zzzx} & 0 \\ 0 & 0 & 0 & 0 & 0 & Q_{yzxy} \\ -Q_{xxzx} & -Q_{yyzx} & -Q_{zzzx} & 0 & 0 & 0 \\ 0 & 0 & 0 & -Q_{yzxy} & 0 & 0 \end{bmatrix}$$

$$Q_{xxyy} = 4G_{f3}^{(1)} - 2Q_{dv}^{(3)}$$

$$Q_{xxzz} = -4G_{f3}^{(1)} + 3Q_{du}^{(3)} - Q_{dv}^{(3)}$$

$$Q_{xxzx} = 2G_{fay}^{(1)} + 2G_{fb}^{(1)} - 2G_{py}^{(1)} + Q_{dxx}^{(3)}$$

$$Q_{yyzz} = 4G_{f3}^{(1)} + 3Q_{du}^{(3)} + Q_{dv}^{(3)}$$

$$Q_{yyzx} = -4G_{fb}^{(1)} + Q_{dxx}^{(3)}$$

$$Q_{zzzx} = -2G_{fay}^{(1)} + 2G_{fb}^{(1)} + 2G_{py}^{(1)} + Q_{dxx}^{(3)}$$

$$Q_{yzxy} = 4G_{fay}^{(1)} + G_{py}^{(1)}$$

\* Rank 4 tensor (aas).

$$\begin{bmatrix} Q_{yzyz} & 0 & Q_{yzxy} \\ 0 & Q_{zxzx} & 0 \\ Q_{yzxy} & 0 & Q_{xyxy} \end{bmatrix}$$

$$Q_{yzyz} = -2Q_{du}^{(4)} + 2Q_{dv}^{(4)} + Q_s^{(3)}$$

$$Q_{yzxy} = 2Q_{dxz}^{(4)}$$

$$Q_{zxzx} = -2Q_{du}^{(4)} - 2Q_{dv}^{(4)} + Q_s^{(3)}$$

$$Q_{xyxy} = 4Q_{du}^{(4)} + Q_s^{(3)}$$

\* Rank 4 tensor (aaa).

$$\begin{bmatrix} 0 & 0 & Q_{yzxy} \\ 0 & 0 & 0 \\ -Q_{yzxy} & 0 & 0 \end{bmatrix}$$

$$Q_{yzxy} = G_{py}^{(2)}$$

\* Rank 4 tensor (sa).

$$\begin{bmatrix} 0 & Q_{xxzx} & 0 \\ 0 & Q_{yyzx} & 0 \\ 0 & Q_{zzzx} & 0 \\ Q_{yzyz} & 0 & Q_{yzxy} \\ 0 & Q_{zxzx} & 0 \\ Q_{xyyz} & 0 & Q_{xyxy} \end{bmatrix}$$

$$Q_{xxzx} = -G_{fay}^{(2)} - G_{fbz}^{(2)} + G_{py}^{(3)} + 2Q_{dxz}^{(5)}$$

$$Q_{yyzx} = 2G_{fay}^{(2)} + G_{py}^{(3)} + 2G_{py}^{(4)}$$

$$Q_{zzzx} = -G_{fay}^{(2)} + G_{fbz}^{(2)} + G_{py}^{(3)} - 2Q_{dxz}^{(5)}$$

$$Q_{yzyz} = G_{f3}^{(2)} - 3Q_{du}^{(5)} - Q_{dv}^{(5)}$$

$$Q_{yzxy} = -G_{fay}^{(2)} + G_{fbz}^{(2)} + G_{py}^{(4)} + Q_{dxz}^{(5)}$$

$$Q_{zxzx} = G_{f3}^{(2)} + 3Q_{du}^{(5)} - Q_{dv}^{(5)}$$

$$Q_{xyyz} = -G_{fay}^{(2)} - G_{fbz}^{(2)} + G_{py}^{(4)} - Q_{dxz}^{(5)}$$

$$Q_{xyxy} = G_{f3}^{(2)} + 2Q_{dv}^{(5)}$$

\* Rank 4 tensor (as).

$$\begin{bmatrix} 0 & 0 & 0 & Q_{yzyz} & 0 & Q_{yzxy} \\ Q_{zxzx} & Q_{zxyy} & Q_{zxzx} & 0 & Q_{zxzx} & 0 \\ 0 & 0 & 0 & Q_{xyyz} & 0 & Q_{xyxy} \end{bmatrix}$$

$$Q_{yzyz} = G_{f3}^{(3)} - 3Q_{du}^{(6)} - Q_{dv}^{(6)}$$

$$Q_{yzxy} = -G_{fay}^{(3)} - G_{fbz}^{(3)} + G_{py}^{(6)} - Q_{dxz}^{(6)}$$

$$Q_{zxzx} = -G_{fay}^{(3)} - G_{fbz}^{(3)} + G_{py}^{(5)} + 2Q_{dxz}^{(6)}$$

$$Q_{zxyy} = 2G_{fay}^{(3)} + G_{py}^{(5)} + 2G_{py}^{(6)}$$

$$Q_{zxzx} = -G_{fay}^{(3)} + G_{fbz}^{(3)} + G_{py}^{(5)} - 2Q_{dxz}^{(6)}$$

$$Q_{zxxz} = G_{f3}^{(3)} + 3Q_{du}^{(6)} - Q_{dv}^{(6)}$$

$$Q_{xyyz} = -G_{fay}^{(3)} + G_{fbz}^{(3)} + G_{py}^{(6)} + Q_{dxz}^{(6)}$$

$$Q_{xyxy} = G_{f3}^{(3)} + 2Q_{dv}^{(6)}$$

\* Rank 4 tensor (s).

$$\begin{bmatrix} Q_{xxxx} & Q_{xxyy} & Q_{xxzz} & 0 & Q_{xxzx} & 0 & 0 & Q_{xxxz} & 0 \\ Q_{yyxx} & Q_{yyyy} & Q_{yyzz} & 0 & Q_{yyzx} & 0 & 0 & Q_{yyxz} & 0 \\ Q_{zzxx} & Q_{zzyy} & Q_{zzzz} & 0 & Q_{zzzx} & 0 & 0 & Q_{zzxz} & 0 \\ 0 & 0 & 0 & Q_{yzyz} & 0 & Q_{yzxy} & Q_{yzyy} & 0 & Q_{yzyx} \\ Q_{zxxx} & Q_{zxyy} & Q_{zxzz} & 0 & Q_{zxzx} & 0 & 0 & Q_{zxzz} & 0 \\ 0 & 0 & 0 & Q_{xyyz} & 0 & Q_{xyxy} & Q_{xyzy} & 0 & Q_{xyyx} \end{bmatrix}$$

$$Q_{xxxx} = -2Q_{du}^{(1)} - 4Q_{du}^{(2)} + 2Q_{dv}^{(1)} + 4Q_{dv}^{(2)} - Q_{gu}^{(1)} + Q_{gv}^{(1)} + 2Q_g^{(1)} + Q_s^{(1)} + 2Q_s^{(2)}$$

$$Q_{xxyy} = 4G_{f3}^{(1)} - 2Q_{du}^{(1)} - 2Q_{dv}^{(3)} + 2Q_{gu}^{(1)} - Q_g^{(1)} + Q_s^{(1)}$$

$$Q_{xxzz} = -4G_{f3}^{(1)} + Q_{du}^{(1)} + 3Q_{du}^{(3)} + Q_{dv}^{(1)} - Q_{dv}^{(3)} - Q_{gu}^{(1)} - Q_{gv}^{(1)} - Q_g^{(1)} + Q_s^{(1)}$$

$$Q_{xxzx} = 2G_{fay}^{(1)} - G_{fay}^{(2)} + 2G_{fby}^{(1)} - G_{fby}^{(2)} - 2G_{py}^{(1)} + G_{py}^{(3)} + Q_{dxz}^{(1)} + 2Q_{dxz}^{(2)} + Q_{dxz}^{(3)} + 2Q_{dxz}^{(5)} - Q_{gay}^{(1)} - Q_{gby}^{(1)}$$

$$Q_{xxxz} = 2G_{fay}^{(1)} + G_{fay}^{(2)} + 2G_{fby}^{(1)} + G_{fby}^{(2)} - 2G_{py}^{(1)} - G_{py}^{(3)} + Q_{dxz}^{(1)} + 2Q_{dxz}^{(2)} + Q_{dxz}^{(3)} - 2Q_{dxz}^{(5)} - Q_{gay}^{(1)} - Q_{gby}^{(1)}$$

$$Q_{yyxx} = -4G_{f3}^{(1)} - 2Q_{du}^{(1)} + 2Q_{dv}^{(3)} + 2Q_{gu}^{(1)} - Q_g^{(1)} + Q_s^{(1)}$$

$$Q_{yyyy} = -2Q_{du}^{(1)} - 4Q_{du}^{(2)} - 2Q_{dv}^{(1)} - 4Q_{dv}^{(2)} - Q_{gu}^{(1)} - Q_{gv}^{(1)} + 2Q_g^{(1)} + Q_s^{(1)} + 2Q_s^{(2)}$$

$$Q_{yyzz} = 4G_{f3}^{(1)} + Q_{du}^{(1)} + 3Q_{du}^{(3)} - Q_{dv}^{(1)} + Q_{dv}^{(3)} - Q_{gu}^{(1)} + Q_{gv}^{(1)} - Q_g^{(1)} + Q_s^{(1)}$$

$$Q_{yyzx} = 2G_{fay}^{(2)} - 4G_{fby}^{(1)} + G_{py}^{(3)} + 2G_{py}^{(4)} + Q_{dxz}^{(1)} + Q_{dxz}^{(3)} + 2Q_{gby}^{(1)}$$

$$Q_{yyxz} = -2G_{fay}^{(2)} - 4G_{fby}^{(1)} - G_{py}^{(3)} - 2G_{py}^{(4)} + Q_{dxz}^{(1)} + Q_{dxz}^{(3)} + 2Q_{gby}^{(1)}$$

$$Q_{zzxx} = 4G_{f3}^{(1)} + Q_{du}^{(1)} - 3Q_{du}^{(3)} + Q_{dv}^{(1)} + Q_{dv}^{(3)} - Q_{gu}^{(1)} - Q_{gv}^{(1)} - Q_g^{(1)} + Q_s^{(1)}$$

$$Q_{zzyy} = -4G_{f3}^{(1)} + Q_{du}^{(1)} - 3Q_{du}^{(3)} - Q_{dv}^{(1)} - Q_{dv}^{(3)} - Q_{gu}^{(1)} + Q_{gv}^{(1)} - Q_g^{(1)} + Q_s^{(1)}$$

$$Q_{zzzz} = 4Q_{du}^{(1)} + 8Q_{du}^{(2)} + 2Q_{gu}^{(1)} + 2Q_g^{(1)} + Q_s^{(1)} + 2Q_s^{(2)}$$

$$Q_{zzzx} = -2G_{fay}^{(1)} - G_{fay}^{(2)} + 2G_{fby}^{(1)} + G_{fby}^{(2)} + 2G_{py}^{(1)} + G_{py}^{(3)} + Q_{dxz}^{(1)} + 2Q_{dxz}^{(2)} + Q_{dxz}^{(3)} - 2Q_{dxz}^{(5)} + Q_{gay}^{(1)} - Q_{gby}^{(1)}$$

$$Q_{zzxz} = -2G_{fay}^{(1)} + G_{fay}^{(2)} + 2G_{fby}^{(1)} - G_{fby}^{(2)} + 2G_{py}^{(1)} - G_{py}^{(3)} + Q_{dxz}^{(1)} + 2Q_{dxz}^{(2)} + Q_{dxz}^{(3)} + 2Q_{dxz}^{(5)} + Q_{gay}^{(1)} - Q_{gby}^{(1)}$$

$$Q_{yzyz} = G_{f3}^{(2)} + Q_{du}^{(2)} - 3Q_{du}^{(5)} - Q_{dv}^{(2)} - Q_{dv}^{(5)} - Q_{gu}^{(1)} + Q_{gv}^{(1)} - Q_g^{(1)} + Q_s^{(2)}$$

$$Q_{yzxy} = 4G_{fay}^{(1)} - G_{fay}^{(2)} + G_{fby}^{(1)} + G_{fby}^{(2)} + G_{py}^{(1)} + G_{py}^{(4)} + Q_{dxz}^{(1)} + Q_{dxz}^{(5)} + 2Q_{gby}^{(1)}$$

$$Q_{yzyy} = -G_{f3}^{(2)} + Q_{du}^{(2)} + 3Q_{du}^{(5)} - Q_{dv}^{(2)} + Q_{dv}^{(5)} - Q_{gu}^{(1)} + Q_{gv}^{(1)} - Q_g^{(1)} + Q_s^{(2)}$$

$$Q_{yzyx} = 4G_{fay}^{(1)} + G_{fay}^{(2)} - G_{fby}^{(1)} + G_{fby}^{(2)} + G_{py}^{(1)} - G_{py}^{(4)} + Q_{dxz}^{(2)} - Q_{dxz}^{(5)} + 2Q_{gby}^{(1)}$$

$$Q_{zxxx} = -2G_{fay}^{(1)} - 2G_{fby}^{(1)} + 2G_{py}^{(1)} + Q_{dxz}^{(2)} - Q_{dxz}^{(5)} - Q_{gay}^{(1)} - Q_{gby}^{(1)}$$

$$Q_{zxyy} = 4G_{fby}^{(1)} + Q_{dxz}^{(2)} - Q_{dxz}^{(5)} + 2Q_{gby}^{(1)}$$

$$Q_{zzzz} = 2G_{fay}^{(1)} - 2G_{fby}^{(1)} - 2G_{py}^{(1)} + Q_{dxz}^{(1)} + 2Q_{dxz}^{(2)} - Q_{dxz}^{(3)} + Q_{gay}^{(1)} - Q_{gby}^{(1)}$$

$$Q_{zzzx} = G_{f3}^{(2)} + Q_{du}^{(2)} + 3Q_{du}^{(5)} + Q_{dv}^{(2)} - Q_{dv}^{(5)} - Q_{gu}^{(1)} - Q_{gv}^{(1)} - Q_g^{(1)} + Q_s^{(2)}$$

$$Q_{zzxz} = -G_{f3}^{(2)} + Q_{du}^{(2)} - 3Q_{du}^{(5)} + Q_{dv}^{(2)} + Q_{dv}^{(5)} - Q_{gu}^{(1)} - Q_{gv}^{(1)} - Q_g^{(1)} + Q_s^{(2)}$$

$$Q_{xyyz} = -4G_{fay}^{(1)} - G_{fay}^{(2)} - G_{fby}^{(1)} - G_{fby}^{(2)} - G_{py}^{(1)} + G_{py}^{(4)} + Q_{dxz}^{(2)} - Q_{dxz}^{(5)} + 2Q_{gby}^{(1)}$$

$$Q_{xyxy} = G_{f3}^{(2)} - 2Q_{du}^{(2)} + 2Q_{dv}^{(5)} + 2Q_{gu}^{(1)} - Q_g^{(1)} + Q_s^{(2)}$$

$$Q_{xyzy} = -4G_{fay}^{(1)} + G_{fay}^{(2)} + G_{fby}^{(1)} - G_{fby}^{(2)} - G_{py}^{(1)} - G_{py}^{(4)} + Q_{dxz}^{(2)} + Q_{dxz}^{(5)} + 2Q_{gby}^{(1)}$$

$$Q_{xyyx} = -G_{f3}^{(2)} - 2Q_{du}^{(2)} - 2Q_{dv}^{(5)} + 2Q_{gu}^{(1)} - Q_g^{(1)} + Q_s^{(2)}$$

\* Rank 4 tensor (a).

$$\begin{bmatrix} 0 & 0 & 0 & Q_{yzyz} & 0 & Q_{yzxy} & Q_{yzyy} & 0 & Q_{yzyx} \\ Q_{zxxx} & Q_{zxyy} & Q_{zxzz} & 0 & Q_{zxzx} & 0 & 0 & Q_{zxzz} & 0 \\ 0 & 0 & 0 & Q_{xyyz} & 0 & Q_{xyxy} & Q_{xyzy} & 0 & Q_{xyyx} \end{bmatrix}$$

$$\begin{aligned}
Q_{yzyz} &= G_{f3}^{(3)} - 2Q_{du}^{(4)} - 3Q_{du}^{(6)} + 2Q_{dv}^{(4)} - Q_{dv}^{(6)} + Q_s^{(3)} \\
Q_{yzxy} &= -G_{fay}^{(3)} - G_{fb}^{(3)} + G_{py}^{(2)} + G_{py}^{(6)} + 2Q_{dxz}^{(4)} - Q_{dxz}^{(6)} \\
Q_{yzyy} &= G_{f3}^{(3)} + 2Q_{du}^{(4)} - 3Q_{du}^{(6)} - 2Q_{dv}^{(4)} - Q_{dv}^{(6)} - Q_s^{(3)} \\
Q_{yzyx} &= -G_{fay}^{(3)} - G_{fb}^{(3)} - G_{py}^{(2)} + G_{py}^{(6)} - 2Q_{dxz}^{(4)} - Q_{dxz}^{(6)} \\
Q_{zxxx} &= -G_{fay}^{(3)} - G_{fb}^{(3)} + G_{py}^{(5)} + 2Q_{dxz}^{(6)} \\
Q_{zxyy} &= 2G_{fay}^{(3)} + G_{py}^{(5)} + 2G_{py}^{(6)} \\
Q_{zxzz} &= -G_{fay}^{(3)} + G_{fb}^{(3)} + G_{py}^{(5)} - 2Q_{dxz}^{(6)} \\
Q_{zxzx} &= G_{f3}^{(3)} - 2Q_{du}^{(4)} + 3Q_{du}^{(6)} - 2Q_{dv}^{(4)} - Q_{dv}^{(6)} + Q_s^{(3)} \\
Q_{zxzx} &= G_{f3}^{(3)} + 2Q_{du}^{(4)} + 3Q_{du}^{(6)} + 2Q_{dv}^{(4)} - Q_{dv}^{(6)} - Q_s^{(3)} \\
Q_{xyyz} &= -G_{fay}^{(3)} + G_{fb}^{(3)} - G_{py}^{(2)} + G_{py}^{(6)} + 2Q_{dxz}^{(4)} + Q_{dxz}^{(6)} \\
Q_{xyxy} &= G_{f3}^{(3)} + 4Q_{du}^{(4)} + 2Q_{dv}^{(6)} + Q_s^{(3)} \\
Q_{xyzy} &= -G_{fay}^{(3)} + G_{fb}^{(3)} + G_{py}^{(2)} + G_{py}^{(6)} - 2Q_{dxz}^{(4)} + Q_{dxz}^{(6)} \\
Q_{xyyx} &= G_{f3}^{(3)} - 4Q_{du}^{(4)} + 2Q_{dv}^{(6)} - Q_s^{(3)}
\end{aligned}$$

\* Rank 4 tensor (t).

$$\left[ \begin{array}{ccc}
Q_{xxxx} & 0 & Q_{xxxx} \\
0 & Q_{yyyy} & 0 \\
Q_{zzzx} & 0 & Q_{zzzx} \\
Q_{yyxx} & 0 & Q_{yyzz} \\
Q_{zzxx} & 0 & Q_{zzxz} \\
0 & Q_{xxyy} & 0 \\
0 & Q_{yzyy} & 0 \\
Q_{zxxx} & 0 & Q_{zxxz} \\
Q_{xxyy} + Q_{yyzz} - Q_{yzyy} - Q_{zzxx} + Q_{zzzx} & 0 & Q_{xyyz} \\
0 & Q_{xyyz} + \frac{Q_{zzxz}}{2} - \frac{Q_{zzxx}}{2} & 0
\end{array} \right]$$

$$\begin{aligned}
Q_{xxxx} &= -2Q_{du}^{(1)} - 4Q_{du}^{(2)} + 2Q_{dv}^{(1)} + 4Q_{dv}^{(2)} - Q_{gu}^{(1)} + Q_{gv}^{(1)} + 2Q_g^{(1)} + 3Q_s^{(1)} \\
Q_{xxxx} &= Q_{dxz}^{(1)} + 2Q_{dxz}^{(2)} + Q_{dxz}^{(3)} - 2Q_{dxz}^{(5)} - Q_{gay}^{(1)} - Q_{gb}^{(1)} \\
Q_{yyyy} &= -2Q_{du}^{(1)} - 4Q_{du}^{(2)} - 2Q_{dv}^{(1)} - 4Q_{dv}^{(2)} - Q_{gu}^{(1)} - Q_{gv}^{(1)} + 2Q_g^{(1)} + 3Q_s^{(1)} \\
Q_{zzzx} &= Q_{dxz}^{(1)} + 2Q_{dxz}^{(2)} + Q_{dxz}^{(3)} - 2Q_{dxz}^{(5)} + Q_{gay}^{(1)} - Q_{gb}^{(1)} \\
Q_{zzzz} &= 4Q_{du}^{(1)} + 8Q_{du}^{(2)} + 2Q_{gu}^{(1)} + 2Q_g^{(1)} + 3Q_s^{(1)} \\
Q_{yyzx} &= Q_{dxz}^{(1)} + Q_{dxz}^{(3)} + 2Q_{gb}^{(1)} \\
Q_{yyzz} &= Q_{du}^{(1)} + 3Q_{du}^{(3)} - Q_{du}^{(1)} + Q_{dv}^{(3)} - Q_{gu}^{(1)} + Q_{gv}^{(1)} - Q_g^{(1)} + Q_s^{(1)} \\
Q_{zzxx} &= Q_{du}^{(1)} - 3Q_{du}^{(3)} + Q_{du}^{(1)} + Q_{dv}^{(3)} - Q_{gu}^{(1)} - Q_{gv}^{(1)} - Q_g^{(1)} + Q_s^{(1)} \\
Q_{zzxz} &= Q_{dxz}^{(1)} + 2Q_{dxz}^{(2)} + Q_{dxz}^{(3)} + 2Q_{dxz}^{(5)} + Q_{gay}^{(1)} - Q_{gb}^{(1)} \\
Q_{xxyy} &= -2Q_{du}^{(1)} - 2Q_{dv}^{(3)} + 2Q_{gu}^{(1)} - Q_g^{(1)} + Q_s^{(1)} \\
Q_{yzyy} &= Q_{du}^{(2)} + 3Q_{du}^{(5)} - Q_{dv}^{(2)} + Q_{dv}^{(5)} - Q_{gu}^{(1)} + Q_{gv}^{(1)} - Q_g^{(1)} + Q_s^{(1)} \\
Q_{zxxx} &= Q_{dxz}^{(1)} + 2Q_{dxz}^{(2)} - Q_{dxz}^{(3)} - Q_{gay}^{(1)} - Q_{gb}^{(1)} \\
Q_{zzxz} &= Q_{du}^{(2)} - 3Q_{du}^{(5)} + Q_{dv}^{(2)} + Q_{dv}^{(5)} - Q_{gu}^{(1)} - Q_{gv}^{(1)} - Q_g^{(1)} + Q_s^{(1)} \\
Q_{xyyz} &= Q_{dxz}^{(2)} - Q_{dxz}^{(5)} + 2Q_{gb}^{(1)}
\end{aligned}$$