

PG No. 8  $D_{2h}$   $mmm$  [ orthorhombic ] (polar, internal axial quadrupole)

\* Harmonics for rank 0

\* Harmonics for rank 1

$$\vec{Q}_1^{(2,1)}[g](B_{1u})$$

\*\* symmetry

$$z$$

\*\* expression

$$\frac{\sqrt{30}G_vxy}{5} - \frac{\sqrt{30}G_{xy}(x-y)(x+y)}{10} + \frac{\sqrt{30}G_{xz}yz}{10} - \frac{\sqrt{30}G_{yz}xz}{10}$$

$$\vec{Q}_1^{(2,1)}[g](B_{2u})$$

\*\* symmetry

$$y$$

\*\* expression

$$\frac{3\sqrt{10}G_{uxz}}{10} - \frac{\sqrt{30}G_vxz}{10} - \frac{\sqrt{30}G_{xy}yz}{10} + \frac{\sqrt{30}G_{xz}(x-z)(x+z)}{10} + \frac{\sqrt{30}G_{yz}xy}{10}$$

$$\vec{Q}_1^{(2,1)}[g](B_{3u})$$

\*\* symmetry

$$x$$

\*\* expression

$$-\frac{3\sqrt{10}G_{uyz}}{10} - \frac{\sqrt{30}G_vyz}{10} + \frac{\sqrt{30}G_{xy}xz}{10} - \frac{\sqrt{30}G_{xz}xy}{10} - \frac{\sqrt{30}G_{yz}(y-z)(y+z)}{10}$$

\* Harmonics for rank 2

$$\vec{Q}_2^{(2,-1)}[g](A_g, 1)$$

\*\* symmetry

$$-\frac{x^2}{2} - \frac{y^2}{2} + z^2$$

\*\* expression

$$\frac{\sqrt{2}G_{xz}y}{2} - \frac{\sqrt{2}G_{yz}x}{2}$$

$$\vec{Q}_2^{(2,-1)}[g](A_g, 2)$$

\*\* symmetry

$$\frac{\sqrt{3}(x-y)(x+y)}{2}$$

\*\* expression

$$\frac{\sqrt{6}G_{xyz}}{3} - \frac{\sqrt{6}G_{xz}y}{6} - \frac{\sqrt{6}G_{yz}x}{6}$$

$$\vec{Q}_2^{(2,1)}[g](A_g, 1)$$

\*\* symmetry

$$-\frac{x^2}{2} - \frac{y^2}{2} + z^2$$

\*\* expression

$$\frac{5\sqrt{42}G_vxyz}{14} - \frac{5\sqrt{42}G_{xy}z(x-y)(x+y)}{28} - \frac{\sqrt{42}G_{xz}y(x^2+y^2-4z^2)}{28} + \frac{\sqrt{42}G_{yz}x(x^2+y^2-4z^2)}{28}$$

$$\vec{Q}_2^{(2,1)}[g](A_g, 2)$$

\*\* symmetry

$$\frac{\sqrt{3}(x-y)(x+y)}{2}$$

\*\* expression

$$-\frac{5\sqrt{42}G_{uxyz}}{14} + \frac{\sqrt{14}G_{xy}z(3x^2+3y^2-2z^2)}{28} - \frac{\sqrt{14}G_{xz}y(9x^2-y^2-6z^2)}{28} + \frac{\sqrt{14}G_{yz}x(x^2-9y^2+6z^2)}{28}$$

$$\vec{Q}_2^{(2,-1)}[g](B_{1g})$$

\*\* symmetry

$$\sqrt{3}xy$$

\*\* expression

$$-\frac{\sqrt{6}G_v z}{3} + \frac{\sqrt{6}G_{xz}x}{6} - \frac{\sqrt{6}G_{yz}y}{6}$$

$$\tilde{\mathbb{Q}}_2^{(2,1)}[g](B_{1g})$$

\*\* symmetry

$$\sqrt{3}xy$$

\*\* expression

$$\frac{5\sqrt{42}G_u z (x-y)(x+y)}{28} - \frac{\sqrt{14}G_v z (3x^2 + 3y^2 - 2z^2)}{28} + \frac{\sqrt{14}G_{xz}x (2x^2 - 3y^2 - 3z^2)}{14} + \frac{\sqrt{14}G_{yz}y (3x^2 - 2y^2 + 3z^2)}{14}$$

$$\tilde{\mathbb{Q}}_2^{(2,-1)}[g](B_{2g})$$

\*\* symmetry

$$\sqrt{3}xz$$

\*\* expression

$$-\frac{\sqrt{2}G_u y}{2} + \frac{\sqrt{6}G_v y}{6} - \frac{\sqrt{6}G_{xy}x}{6} + \frac{\sqrt{6}G_{yz}z}{6}$$

$$\tilde{\mathbb{Q}}_2^{(2,1)}[g](B_{2g})$$

\*\* symmetry

$$\sqrt{3}xz$$

\*\* expression

$$\frac{\sqrt{42}G_u y (x^2 + y^2 - 4z^2)}{28} + \frac{\sqrt{14}G_v x (9x^2 - y^2 - 6z^2)}{28} - \frac{\sqrt{14}G_{xy}x (2x^2 - 3y^2 - 3z^2)}{14} - \frac{\sqrt{14}G_{yz}z (3x^2 + 3y^2 - 2z^2)}{14}$$

$$\tilde{\mathbb{Q}}_2^{(2,-1)}[g](B_{3g})$$

\*\* symmetry

$$\sqrt{3}yz$$

\*\* expression

$$\frac{\sqrt{2}G_u x}{2} + \frac{\sqrt{6}G_v x}{6} + \frac{\sqrt{6}G_{xy}y}{6} - \frac{\sqrt{6}G_{xz}z}{6}$$

$$\tilde{\mathbb{Q}}_2^{(2,1)}[g](B_{3g})$$

\*\* symmetry

$$\sqrt{3}yz$$

\*\* expression

$$-\frac{\sqrt{42}G_u x (x^2 + y^2 - 4z^2)}{28} - \frac{\sqrt{14}G_v x (x^2 - 9y^2 + 6z^2)}{28} - \frac{\sqrt{14}G_{xy}y (3x^2 - 2y^2 + 3z^2)}{14} + \frac{\sqrt{14}G_{xz}z (3x^2 + 3y^2 - 2z^2)}{14}$$

\* Harmonics for rank 3

$$\tilde{\mathbb{Q}}_3^{(2,-1)}[g](A_u)$$

\*\* symmetry

$$\sqrt{15}xyz$$

\*\* expression

$$\frac{\sqrt{6}G_u (x-y)(x+y)}{4} + \frac{\sqrt{2}G_v (x^2 + y^2 - 2z^2)}{4}$$

$$\tilde{\mathbb{Q}}_3^{(2,1)}[g](A_u)$$

\*\* symmetry

$$\sqrt{15}xyz$$

\*\* expression

$$-\frac{\sqrt{3}G_u (x-y)(x+y)(x^2 + y^2 - 6z^2)}{6} - \frac{G_v (x^4 - 12x^2y^2 + 6x^2z^2 + y^4 + 6y^2z^2 - 2z^4)}{6} - \frac{7G_{xy}xy(x-y)(x+y)}{6} + \frac{7G_{xz}xz(x-z)(x+z)}{6} - \frac{7G_{yz}yz(y-z)(y+z)}{6}$$

$$\bar{\mathbb{Q}}_3^{(2,-1)}[g](B_{1u}, 1)$$

\*\* symmetry

$$-\frac{z(3x^2 + 3y^2 - 2z^2)}{2}$$

\*\* expression

$$-\frac{\sqrt{30}G_vxy}{10} + \frac{\sqrt{30}G_{xy}(x-y)(x+y)}{20} + \frac{\sqrt{30}G_{xz}yz}{5} - \frac{\sqrt{30}G_{yz}xz}{5}$$

$$\bar{\mathbb{Q}}_3^{(2,-1)}[g](B_{1u}, 2)$$

\*\* symmetry

$$\frac{\sqrt{15}z(x-y)(x+y)}{2}$$

\*\* expression

$$-\frac{\sqrt{6}G_uxy}{2} - \frac{\sqrt{2}G_{xy}(x^2 + y^2 - 2z^2)}{4}$$

$$\bar{\mathbb{Q}}_3^{(2,1)}[g](B_{1u}, 1)$$

\*\* symmetry

$$-\frac{z(3x^2 + 3y^2 - 2z^2)}{2}$$

\*\* expression

$$-\frac{\sqrt{15}G_vxy(x^2 + y^2 - 6z^2)}{6} + \frac{\sqrt{15}G_{xy}(x-y)(x+y)(x^2 + y^2 - 6z^2)}{12} - \frac{\sqrt{15}G_{xz}yz(3x^2 + 3y^2 - 4z^2)}{12} + \frac{\sqrt{15}G_{yz}xz(3x^2 + 3y^2 - 4z^2)}{12}$$

$$\bar{\mathbb{Q}}_3^{(2,1)}[g](B_{1u}, 2)$$

\*\* symmetry

$$\frac{\sqrt{15}z(x-y)(x+y)}{2}$$

\*\* expression

$$\frac{\sqrt{3}G_uxy(x^2 + y^2 - 6z^2)}{3} + \frac{7G_vxy(x-y)(x+y)}{6} - \frac{G_{xy}(5x^4 - 18x^2y^2 - 12x^2z^2 + 5y^4 - 12y^2z^2 + 4z^4)}{12} - \frac{7G_{xz}yz(3x^2 + y^2 - 2z^2)}{12} - \frac{7G_{yz}xz(x^2 + 3y^2 - 2z^2)}{12}$$

$$\bar{\mathbb{Q}}_3^{(2,-1)}[g](B_{2u}, 1)$$

\*\* symmetry

$$-\frac{y(3x^2 - 2y^2 + 3z^2)}{2}$$

\*\* expression

$$-\frac{3\sqrt{10}G_{uxz}}{20} + \frac{\sqrt{30}G_vxz}{20} - \frac{\sqrt{30}G_{xy}yz}{5} - \frac{\sqrt{30}G_{xz}(x-z)(x+z)}{20} + \frac{\sqrt{30}G_{yz}xy}{5}$$

$$\bar{\mathbb{Q}}_3^{(2,-1)}[g](B_{2u}, 2)$$

\*\* symmetry

$$-\frac{\sqrt{15}y(x-z)(x+z)}{2}$$

\*\* expression

$$\frac{\sqrt{6}G_{uxz}}{4} + \frac{3\sqrt{2}G_vxz}{4} - \frac{\sqrt{2}G_{xz}(x^2 - 2y^2 + z^2)}{4}$$

$$\bar{\mathbb{Q}}_3^{(2,1)}[g](B_{2u}, 1)$$

\*\* symmetry

$$-\frac{y(3x^2 - 2y^2 + 3z^2)}{2}$$

\*\* expression

$$-\frac{\sqrt{5}G_{uxz}(x^2 - 6y^2 + z^2)}{4} + \frac{\sqrt{15}G_vxz(x^2 - 6y^2 + z^2)}{12} + \frac{\sqrt{15}G_{xy}yz(3x^2 - 4y^2 + 3z^2)}{12} - \frac{\sqrt{15}G_{xz}(x-z)(x+z)(x^2 - 6y^2 + z^2)}{12} - \frac{\sqrt{15}G_{yz}xy(3x^2 - 4y^2 + 3z^2)}{12}$$

$$\bar{\mathbb{Q}}_3^{(2,1)}[g](B_{2u}, 2)$$

\*\* symmetry

$$-\frac{\sqrt{15}y(x-z)(x+z)}{2}$$

\*\* expression

$$-\frac{\sqrt{3}G_u xz(9x^2-12y^2-5z^2)}{12} + \frac{G_v xz(x^2+36y^2-13z^2)}{12} - \frac{7G_{xy}yz(3x^2-2y^2+z^2)}{12} \\ - \frac{G_{xz}(5x^4-12x^2y^2-18x^2z^2+4y^4-12y^2z^2+5z^4)}{12} - \frac{7G_{yz}xy(x^2-2y^2+3z^2)}{12}$$

$$\tilde{\mathbb{Q}}_3^{(2,-1)}[g](B_{3u}, 1)$$

\*\* symmetry

$$\frac{x(2x^2-3y^2-3z^2)}{2}$$

\*\* expression

$$\frac{3\sqrt{10}G_u yz}{20} + \frac{\sqrt{30}G_v yz}{20} + \frac{\sqrt{30}G_{xy}xz}{5} - \frac{\sqrt{30}G_{xz}xy}{5} + \frac{\sqrt{30}G_{yz}(y-z)(y+z)}{20}$$

$$\tilde{\mathbb{Q}}_3^{(2,-1)}[g](B_{3u}, 2)$$

\*\* symmetry

$$\frac{\sqrt{15}x(y-z)(y+z)}{2}$$

\*\* expression

$$\frac{\sqrt{6}G_u yz}{4} - \frac{3\sqrt{2}G_v yz}{4} + \frac{\sqrt{2}G_{yz}(2x^2-y^2-z^2)}{4}$$

$$\tilde{\mathbb{Q}}_3^{(2,1)}[g](B_{3u}, 1)$$

\*\* symmetry

$$\frac{x(2x^2-3y^2-3z^2)}{2}$$

\*\* expression

$$-\frac{\sqrt{5}G_u yz(6x^2-y^2-z^2)}{4} - \frac{\sqrt{15}G_v yz(6x^2-y^2-z^2)}{12} + \frac{\sqrt{15}G_{xy}xz(4x^2-3y^2-3z^2)}{12} \\ - \frac{\sqrt{15}G_{xz}xy(4x^2-3y^2-3z^2)}{12} - \frac{\sqrt{15}G_{yz}(y-z)(y+z)(6x^2-y^2-z^2)}{12}$$

$$\tilde{\mathbb{Q}}_3^{(2,1)}[g](B_{3u}, 2)$$

\*\* symmetry

$$\frac{\sqrt{15}x(y-z)(y+z)}{2}$$

\*\* expression

$$\frac{\sqrt{3}G_u yz(12x^2-9y^2+5z^2)}{12} - \frac{G_v yz(36x^2+y^2-13z^2)}{12} + \frac{7G_{xy}xz(2x^2-3y^2-z^2)}{12} \\ + \frac{7G_{xz}xy(2x^2-y^2-3z^2)}{12} - \frac{G_{yz}(4x^4-12x^2y^2-12x^2z^2+5y^4-18y^2z^2+5z^4)}{12}$$

\* Harmonics for rank 4

$$\tilde{\mathbb{Q}}_4^{(2,-1)}[g](A_g, 1)$$

\*\* symmetry

$$\frac{\sqrt{21}(x^4-3x^2y^2-3x^2z^2+y^4-3y^2z^2+z^4)}{6}$$

\*\* expression

$$\frac{\sqrt{5}G_{xy}z(x-y)(x+y)}{2} - \frac{\sqrt{5}G_{xz}y(x-z)(x+z)}{2} + \frac{\sqrt{5}G_{yz}x(y-z)(y+z)}{2}$$

$$\tilde{\mathbb{Q}}_4^{(2,-1)}[g](A_g, 2)$$

\*\* symmetry

$$-\frac{\sqrt{15}(x^4-12x^2y^2+6x^2z^2+y^4+6y^2z^2-2z^4)}{12}$$

\*\* expression

$$-\frac{6\sqrt{7}G_v xyz}{7} - \frac{\sqrt{7}G_{xy}z(x-y)(x+y)}{14} + \frac{\sqrt{7}G_{xz}y(4x^2-3y^2+5z^2)}{14} + \frac{\sqrt{7}G_{yz}x(3x^2-4y^2-5z^2)}{14}$$

$$\bar{\mathbb{Q}}_4^{(2,-1)}[g](A_g, 3)$$

\*\* symmetry

$$\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$$

\*\* expression

$$\frac{6\sqrt{7}G_uxyz}{7} + \frac{\sqrt{21}G_{xy}z(3x^2+3y^2-2z^2)}{14} - \frac{\sqrt{21}G_{xz}y(2x^2-y^2+z^2)}{14} + \frac{\sqrt{21}G_{yz}x(x^2-2y^2-z^2)}{14}$$

$$\bar{\mathbb{Q}}_4^{(2,1)}[g](A_g, 1)$$

\*\* symmetry

$$\frac{\sqrt{21}(x^4-3x^2y^2-3x^2z^2+y^4-3y^2z^2+z^4)}{6}$$

\*\* expression

$$\begin{aligned} & -\frac{3\sqrt{2310}G_uxyz(x-y)(x+y)}{44} - \frac{3\sqrt{770}G_vxyz(x^2+y^2-2z^2)}{44} + \frac{\sqrt{770}G_{xy}z(x-y)(x+y)(x^2+y^2-2z^2)}{22} \\ & - \frac{\sqrt{770}G_{xz}y(x-z)(x+z)(x^2-2y^2+z^2)}{22} - \frac{\sqrt{770}G_{yz}x(y-z)(y+z)(2x^2-y^2-z^2)}{22} \end{aligned}$$

$$\bar{\mathbb{Q}}_4^{(2,1)}[g](A_g, 2)$$

\*\* symmetry

$$-\frac{\sqrt{15}(x^4-12x^2y^2+6x^2z^2+y^4+6y^2z^2-2z^4)}{12}$$

\*\* expression

$$\begin{aligned} & \frac{21\sqrt{66}G_uxyz(x-y)(x+y)}{44} - \frac{21\sqrt{22}G_vxyz(x^2+y^2-2z^2)}{44} + \frac{7\sqrt{22}G_{xy}z(x-y)(x+y)(x^2+y^2-2z^2)}{44} \\ & + \frac{\sqrt{22}G_{xz}y(17x^4-22x^2y^2-36x^2z^2+3y^4-8y^2z^2+10z^4)}{44} - \frac{\sqrt{22}G_{yz}x(3x^4-22x^2y^2-8x^2z^2+17y^4-36y^2z^2+10z^4)}{44} \end{aligned}$$

$$\bar{\mathbb{Q}}_4^{(2,1)}[g](A_g, 3)$$

\*\* symmetry

$$\frac{\sqrt{5}(x-y)(x+y)(x^2+y^2-6z^2)}{4}$$

\*\* expression

$$\begin{aligned} & -\frac{21\sqrt{22}G_uxyz(x^2+y^2-2z^2)}{44} - \frac{21\sqrt{66}G_vxyz(x-y)(x+y)}{44} + \frac{\sqrt{66}G_{xy}z(9x^4-24x^2y^2-10x^2z^2+9y^4-10y^2z^2+2z^4)}{44} \\ & - \frac{\sqrt{66}G_{xz}y(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{44} - \frac{\sqrt{66}G_{yz}x(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{44} \end{aligned}$$

$$\bar{\mathbb{Q}}_4^{(2,-1)}[g](B_{1g}, 1)$$

\*\* symmetry

$$\frac{\sqrt{35}xy(x-y)(x+y)}{2}$$

\*\* expression

$$-\frac{\sqrt{3}G_vz(x-y)(x+y)}{2} + \sqrt{3}G_{xy}xyz + \frac{\sqrt{3}G_{xz}x(x^2-3y^2)}{4} - \frac{\sqrt{3}G_{yz}y(3x^2-y^2)}{4}$$

$$\bar{\mathbb{Q}}_4^{(2,-1)}[g](B_{1g}, 2)$$

\*\* symmetry

$$-\frac{\sqrt{5}xy(x^2+y^2-6z^2)}{2}$$

\*\* expression

$$\frac{3\sqrt{7}G_uz(x-y)(x+y)}{7} + \frac{\sqrt{21}G_vz(3x^2+3y^2-2z^2)}{14} - \frac{\sqrt{21}G_{xz}x(x^2-5y^2+2z^2)}{28} - \frac{\sqrt{21}G_{yz}y(5x^2-y^2-2z^2)}{28}$$

$$\bar{\mathbb{Q}}_4^{(2,1)}[g](B_{1g}, 1)$$

\*\* symmetry

$$\frac{\sqrt{35}xy(x-y)(x+y)}{2}$$

\*\* expression

$$\frac{9\sqrt{154}G_u z (x^2 - 2xy - y^2) (x^2 + 2xy - y^2)}{88} - \frac{\sqrt{462}G_v z (x - y) (x + y) (x^2 + y^2 - 2z^2)}{88} + \frac{\sqrt{462}G_{xy}xyz (x^2 + y^2 - 2z^2)}{44} \\ + \frac{\sqrt{462}G_{xz}x (x^4 - 8x^2y^2 - 2x^2z^2 + 3y^4 + 6y^2z^2)}{44} + \frac{\sqrt{462}G_{yz}y (3x^4 - 8x^2y^2 + 6x^2z^2 + y^4 - 2y^2z^2)}{44}$$

$$\tilde{Q}_4^{(2,1)}[g](B_{1g}, 2)$$

\*\* symmetry

$$-\frac{\sqrt{5}xy (x^2 + y^2 - 6z^2)}{2}$$

\*\* expression

$$-\frac{21\sqrt{22}G_u z (x - y) (x + y) (x^2 + y^2 - 2z^2)}{88} - \frac{\sqrt{66}G_v z (3x^4 - 78x^2y^2 + 20x^2z^2 + 3y^4 + 20y^2z^2 - 4z^4)}{88} - \frac{21\sqrt{66}G_{xy}xyz (x - y) (x + y)}{44} \\ - \frac{\sqrt{66}G_{xz}x (x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{44} + \frac{\sqrt{66}G_{yz}y (x^4 + 2x^2y^2 - 12x^2z^2 + y^4 - 12y^2z^2 + 8z^4)}{44}$$

$$\tilde{Q}_4^{(2,-1)}[g](B_{2g}, 1)$$

\*\* symmetry

$$-\frac{\sqrt{35}xz (x - z) (x + z)}{2}$$

\*\* expression

$$\frac{3G_u y (x - z) (x + z)}{4} - \frac{\sqrt{3}G_v y (x - z) (x + z)}{4} + \frac{\sqrt{3}G_{xy}x (x^2 - 3z^2)}{4} + \sqrt{3}G_{xz}xyz - \frac{\sqrt{3}G_{yz}z (3x^2 - z^2)}{4}$$

$$\tilde{Q}_4^{(2,-1)}[g](B_{2g}, 2)$$

\*\* symmetry

$$-\frac{\sqrt{5}xz (x^2 - 6y^2 + z^2)}{2}$$

\*\* expression

$$\frac{3\sqrt{7}G_u y (5x^2 - 2y^2 + z^2)}{28} + \frac{\sqrt{21}G_v y (3x^2 + 2y^2 - 9z^2)}{28} + \frac{\sqrt{21}G_{xy}x (x^2 + 2y^2 - 5z^2)}{28} + \frac{\sqrt{21}G_{yz}z (5x^2 - 2y^2 - z^2)}{28}$$

$$\tilde{Q}_4^{(2,1)}[g](B_{2g}, 1)$$

\*\* symmetry

$$-\frac{\sqrt{35}xz (x - z) (x + z)}{2}$$

\*\* expression

$$-\frac{3\sqrt{154}G_u y (x^4 + x^2y^2 - 9x^2z^2 - y^2z^2 + 2z^4)}{88} - \frac{\sqrt{462}G_v y (5x^4 - x^2y^2 - 27x^2z^2 + y^2z^2 + 4z^4)}{88} \\ + \frac{\sqrt{462}G_{xy}x (x^4 - 2x^2y^2 - 8x^2z^2 + 6y^2z^2 + 3z^4)}{44} + \frac{\sqrt{462}G_{xz}xyz (x^2 - 2y^2 + z^2)}{44} + \frac{\sqrt{462}G_{yz}z (3x^4 + 6x^2y^2 - 8x^2z^2 - 2y^2z^2 + z^4)}{44}$$

$$\tilde{Q}_4^{(2,1)}[g](B_{2g}, 2)$$

\*\* symmetry

$$-\frac{\sqrt{5}xz (x^2 - 6y^2 + z^2)}{2}$$

\*\* expression

$$-\frac{3\sqrt{22}G_u y (5x^4 + 3x^2y^2 - 39x^2z^2 - 2y^4 + 17y^2z^2 - 2z^4)}{88} - \frac{\sqrt{66}G_v y (9x^4 - 31x^2y^2 + 39x^2z^2 + 2y^4 + 11y^2z^2 - 12z^4)}{88} \\ + \frac{\sqrt{66}G_{xy}x (x^4 - 12x^2y^2 + 2x^2z^2 + 8y^4 - 12y^2z^2 + z^4)}{44} + \frac{21\sqrt{66}G_{xz}xyz (x - z) (x + z)}{44} - \frac{\sqrt{66}G_{yz}z (x^4 - 12x^2y^2 + 2x^2z^2 + 8y^4 - 12y^2z^2 + z^4)}{44}$$

$$\tilde{Q}_4^{(2,-1)}[g](B_{3g}, 1)$$

\*\* symmetry

$$\frac{\sqrt{35}yz (y - z) (y + z)}{2}$$

\*\* expression

$$\frac{3G_u x (y - z) (y + z)}{4} + \frac{\sqrt{3}G_v x (y - z) (y + z)}{4} + \frac{\sqrt{3}G_{xy}y (y^2 - 3z^2)}{4} - \frac{\sqrt{3}G_{xz}z (3y^2 - z^2)}{4} + \sqrt{3}G_{yz}xyz$$

$$\tilde{Q}_4^{(2,-1)}[g](B_{3g}, 2)$$

\*\* symmetry

$$\frac{\sqrt{5}yz(6x^2 - y^2 - z^2)}{2}$$

\*\* expression

$$\frac{3\sqrt{7}G_u x(2x^2 - 5y^2 - z^2)}{28} + \frac{\sqrt{21}G_v x(2x^2 + 3y^2 - 9z^2)}{28} - \frac{\sqrt{21}G_{xy} y(2x^2 + y^2 - 5z^2)}{28} + \frac{\sqrt{21}G_{xz} z(2x^2 - 5y^2 + z^2)}{28}$$

$$\bar{\mathbb{Q}}_4^{(2,1)}[g](B_{3g}, 1)$$

\*\* symmetry

$$\frac{\sqrt{35}yz(y-z)(y+z)}{2}$$

\*\* expression

$$\begin{aligned} & - \frac{3\sqrt{154}G_u x(x^2 y^2 - x^2 z^2 + y^4 - 9y^2 z^2 + 2z^4)}{88} - \frac{\sqrt{462}G_v x(x^2 y^2 - x^2 z^2 - 5y^4 + 27y^2 z^2 - 4z^4)}{88} \\ & - \frac{\sqrt{462}G_{xy} y(2x^2 y^2 - 6x^2 z^2 - y^4 + 8y^2 z^2 - 3z^4)}{44} + \frac{\sqrt{462}G_{xz} z(6x^2 y^2 - 2x^2 z^2 + 3y^4 - 8y^2 z^2 + z^4)}{44} - \frac{\sqrt{462}G_{yz} x y z(2x^2 - y^2 - z^2)}{44} \end{aligned}$$

$$\bar{\mathbb{Q}}_4^{(2,1)}[g](B_{3g}, 2)$$

\*\* symmetry

$$\frac{\sqrt{5}yz(6x^2 - y^2 - z^2)}{2}$$

\*\* expression

$$\begin{aligned} & - \frac{3\sqrt{22}G_u x(2x^4 - 3x^2 y^2 - 17x^2 z^2 - 5y^4 + 39y^2 z^2 + 2z^4)}{88} - \frac{\sqrt{66}G_v x(2x^4 - 31x^2 y^2 + 11x^2 z^2 + 9y^4 + 39y^2 z^2 - 12z^4)}{88} \\ & - \frac{\sqrt{66}G_{xy} y(8x^4 - 12x^2 y^2 - 12x^2 z^2 + y^4 + 2y^2 z^2 + z^4)}{44} + \frac{\sqrt{66}G_{xz} z(8x^4 - 12x^2 y^2 - 12x^2 z^2 + y^4 + 2y^2 z^2 + z^4)}{44} - \frac{21\sqrt{66}G_{yz} x y z(y-z)(y+z)}{44} \end{aligned}$$