

PG No. 22  $C_{3h} \quad \bar{6} \quad [ \text{hexagonal} ] \quad (\text{axial, internal polar octupole})$

\* Harmonics for rank 0

\* Harmonics for rank 1

$$\vec{G}_1^{(3,2)}[q](A')$$

\*\* symmetry

$$z$$

\*\* expression

$$-\frac{3\sqrt{70}Q_1x(x^2-3y^2)}{56} + \frac{3\sqrt{70}Q_2y(3x^2-y^2)}{56} - \frac{\sqrt{105}Q_3z(x-y)(x+y)}{14} - \frac{\sqrt{42}Q_{3x}y(x^2+y^2-4z^2)}{56} + \frac{\sqrt{42}Q_{3y}x(x^2+y^2-4z^2)}{56} + \frac{\sqrt{105}Q_{bz}xyz}{7}$$

$$\vec{G}_{1,1}^{(3,2)}[q](E''), \vec{G}_{1,2}^{(3,2)}[q](E'')$$

\*\* symmetry

$$x$$

$$y$$

\*\* expression

$$\begin{aligned} & \frac{3\sqrt{70}Q_1z(x-y)(x+y)}{56} - \frac{3\sqrt{70}Q_2xyz}{28} - \frac{\sqrt{105}Q_3x(y-z)(y+z)}{14} - \frac{5\sqrt{42}Q_{3x}xyz}{28} \\ & - \frac{\sqrt{42}Q_{3y}z(x^2+11y^2-4z^2)}{56} + \frac{3\sqrt{7}Q_{az}y(x^2+y^2-4z^2)}{28} - \frac{\sqrt{105}Q_{bz}y(x^2-y^2+2z^2)}{28} \\ & - \frac{3\sqrt{70}Q_1xyz}{28} - \frac{3\sqrt{70}Q_2z(x-y)(x+y)}{56} + \frac{\sqrt{105}Q_3y(x-z)(x+z)}{14} + \frac{\sqrt{42}Q_{3x}z(11x^2+y^2-4z^2)}{56} \\ & + \frac{5\sqrt{42}Q_{3y}xyz}{28} - \frac{3\sqrt{7}Q_{az}x(x^2+y^2-4z^2)}{28} + \frac{\sqrt{105}Q_{bz}x(x^2-y^2-2z^2)}{28} \end{aligned}$$

\* Harmonics for rank 2

$$\vec{G}_2^{(3,0)}[q](A'')$$

\*\* symmetry

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

\*\* expression

$$-\frac{\sqrt{210}Q_3(x-y)(x+y)}{28} + \frac{\sqrt{21}Q_{3x}yz}{7} - \frac{\sqrt{21}Q_{3y}xz}{7} + \frac{\sqrt{210}Q_{bz}xy}{14}$$

$$\vec{G}_2^{(3,2)}[q](A'')$$

\*\* symmetry

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

\*\* expression

$$\begin{aligned} & -\frac{\sqrt{70}Q_1xz(x^2-3y^2)}{8} + \frac{\sqrt{70}Q_2yz(3x^2-y^2)}{8} + \frac{\sqrt{105}Q_3(x-y)(x+y)(x^2+y^2-6z^2)}{42} \\ & - \frac{5\sqrt{42}Q_{3x}yz(3x^2+3y^2-4z^2)}{168} + \frac{5\sqrt{42}Q_{3y}xz(3x^2+3y^2-4z^2)}{168} - \frac{\sqrt{105}Q_{bz}xy(x^2+y^2-6z^2)}{21} \end{aligned}$$

$$\vec{G}_{2,1}^{(3,0)}[q](E'), \vec{G}_{2,2}^{(3,0)}[q](E')$$

\*\* symmetry

$$\sqrt{3}yz$$

$$-\sqrt{3}xz$$

\*\* expression

$$\frac{\sqrt{105}Q_1xy}{14} + \frac{\sqrt{105}Q_2(x-y)(x+y)}{28} + \frac{\sqrt{7}Q_{3x}(5x^2-y^2-4z^2)}{28} + \frac{3\sqrt{7}Q_{3y}xy}{14} + \frac{\sqrt{42}Q_{az}xz}{7}$$

$$\frac{\sqrt{105}Q_1(x-y)(x+y)}{28} - \frac{\sqrt{105}Q_2xy}{14} + \frac{3\sqrt{7}Q_{3x}xy}{14} - \frac{\sqrt{7}Q_{3y}(x^2-5y^2+4z^2)}{28} + \frac{\sqrt{42}Q_{az}yz}{7}$$

$$\vec{G}_{2,1}^{(3,2)}[q](E'), \vec{G}_{2,2}^{(3,2)}[q](E')$$

\*\* symmetry

$$\sqrt{3}yz$$

$$-\sqrt{3}xz$$

\*\* expression

$$\begin{aligned} & -\frac{\sqrt{210}Q_1xy(11x^2-17y^2+18z^2)}{168} - \frac{\sqrt{210}Q_2(2x^4-21x^2y^2+9x^2z^2+5y^4-9y^2z^2)}{168} \\ & + \frac{\sqrt{35}Q_3yz(y-z)(y+z)}{6} - \frac{5\sqrt{14}Q_{3x}(2x^4+3x^2y^2-15x^2z^2+y^4-9y^2z^2+4z^4)}{168} \\ & - \frac{5\sqrt{14}Q_{3y}xy(x^2+y^2-6z^2)}{168} - \frac{5\sqrt{21}Q_{az}xz(3x^2+3y^2-4z^2)}{84} + \frac{\sqrt{35}Q_{bz}xz(x^2+3y^2-2z^2)}{12} \\ & \frac{\sqrt{210}Q_1(5x^4-21x^2y^2-9x^2z^2+2y^4+9y^2z^2)}{168} - \frac{\sqrt{210}Q_2xy(17x^2-11y^2-18z^2)}{168} + \frac{\sqrt{35}Q_3xz(x-z)(x+z)}{6} - \frac{5\sqrt{14}Q_{3x}xy(x^2+y^2-6z^2)}{168} \\ & - \frac{5\sqrt{14}Q_{3y}(x^4+3x^2y^2-9x^2z^2+2y^4-15y^2z^2+4z^4)}{168} - \frac{5\sqrt{21}Q_{az}yz(3x^2+3y^2-4z^2)}{84} - \frac{\sqrt{35}Q_{bz}yz(3x^2+y^2-2z^2)}{12} \end{aligned}$$

$$\vec{\mathbb{G}}_{2,1}^{(3,0)}[q](E''), \vec{\mathbb{G}}_{2,2}^{(3,0)}[q](E'')$$

\*\* symmetry

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

$$-\sqrt{3}xy$$

\*\* expression

$$\begin{aligned} & \frac{\sqrt{105}Q_1xz}{14} - \frac{\sqrt{105}Q_2yz}{14} - \frac{\sqrt{70}Q_3(x^2+y^2-2z^2)}{28} - \frac{3\sqrt{7}Q_{3x}yz}{14} - \frac{3\sqrt{7}Q_{3y}xz}{14} + \frac{\sqrt{42}Q_{az}xy}{14} \\ & \frac{\sqrt{105}Q_1yz}{14} + \frac{\sqrt{105}Q_2xz}{14} - \frac{3\sqrt{7}Q_{3x}xz}{14} + \frac{3\sqrt{7}Q_{3y}yz}{14} + \frac{\sqrt{42}Q_{az}(x-y)(x+y)}{28} - \frac{\sqrt{70}Q_{bz}(x^2+y^2-2z^2)}{28} \end{aligned}$$

$$\vec{\mathbb{G}}_{2,1}^{(3,2)}[q](E''), \vec{\mathbb{G}}_{2,2}^{(3,2)}[q](E'')$$

\*\* symmetry

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

$$-\sqrt{3}xy$$

\*\* expression

$$\begin{aligned} & \frac{\sqrt{210}Q_1xz(3x^2+3y^2-4z^2)}{168} - \frac{\sqrt{210}Q_2yz(3x^2+3y^2-4z^2)}{168} + \frac{\sqrt{35}Q_3(x^4-12x^2y^2+6x^2z^2+y^4+6y^2z^2-2z^4)}{42} \\ & - \frac{5\sqrt{14}Q_{3x}yz(27x^2-y^2-8z^2)}{168} + \frac{5\sqrt{14}Q_{3y}xz(x^2-27y^2+8z^2)}{168} + \frac{5\sqrt{21}Q_{az}xy(x^2+y^2-6z^2)}{42} - \frac{\sqrt{35}Q_{bz}xy(x-y)(x+y)}{6} \\ & \frac{\sqrt{210}Q_1yz(3x^2+3y^2-4z^2)}{168} + \frac{\sqrt{210}Q_2xz(3x^2+3y^2-4z^2)}{168} - \frac{\sqrt{35}Q_3xy(x-y)(x+y)}{6} - \frac{5\sqrt{14}Q_{3x}xz(13x^2-15y^2-8z^2)}{168} \\ & - \frac{5\sqrt{14}Q_{3y}yz(15x^2-13y^2+8z^2)}{168} + \frac{5\sqrt{21}Q_{az}(x-y)(x+y)(x^2+y^2-6z^2)}{84} - \frac{\sqrt{35}Q_{bz}(5x^4-18x^2y^2-12x^2z^2+5y^4-12y^2z^2+4z^4)}{84} \end{aligned}$$

\* Harmonics for rank 3

$$\vec{\mathbb{G}}_3^{(3,-2)}[q](A')$$

\*\* symmetry

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

\*\* expression

$$\frac{\sqrt{2}Q_{3xy}}{2} - \frac{\sqrt{2}Q_{3yx}}{2}$$

$$\vec{\mathbb{G}}_3^{(3,0)}[q](A')$$

\*\* symmetry

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

\*\* expression

$$\frac{\sqrt{15}Q_1x(x^2-3y^2)}{12} - \frac{\sqrt{15}Q_2y(3x^2-y^2)}{12} - \frac{\sqrt{10}Q_3z(x-y)(x+y)}{4} - \frac{Q_{3xy}(x^2+y^2-4z^2)}{4} + \frac{Q_{3yx}(x^2+y^2-4z^2)}{4} + \frac{\sqrt{10}Q_{bz}xyz}{2}$$

$$\vec{\mathbb{G}}_3^{(3,2)}[q](A')$$

\*\* symmetry

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

\*\* expression

$$\frac{7\sqrt{330}Q_1x(x^2-3y^2)(x^2+y^2-8z^2)}{528} - \frac{7\sqrt{330}Q_2y(x^2-y^2)(x^2+y^2-8z^2)}{528} + \frac{7\sqrt{55}Q_3z(x-y)(x+y)(x^2+y^2-2z^2)}{44} \\ + \frac{5\sqrt{22}Q_3xy(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{176} - \frac{5\sqrt{22}Q_3yx(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{176} - \frac{7\sqrt{55}Q_{bz}xyz(x^2+y^2-2z^2)}{22}$$

$$\tilde{\mathbb{G}}_3^{(3,-2)}[q](A'', 1)$$

\*\* symmetry

$$\frac{\sqrt{10}y(3x^2-y^2)}{4}$$

\*\* expression

$$-\frac{\sqrt{3}Q_2z}{2} - \frac{\sqrt{2}Q_3y}{4} + \frac{\sqrt{2}Q_{bz}x}{4}$$

$$\tilde{\mathbb{G}}_3^{(3,-2)}[q](A'', 2)$$

\*\* symmetry

$$\frac{\sqrt{10}x(x^2-3y^2)}{4}$$

\*\* expression

$$\frac{\sqrt{3}Q_1z}{2} - \frac{\sqrt{2}Q_3x}{4} - \frac{\sqrt{2}Q_{bz}y}{4}$$

$$\tilde{\mathbb{G}}_3^{(3,0)}[q](A'', 1)$$

\*\* symmetry

$$\frac{\sqrt{10}y(3x^2-y^2)}{4}$$

\*\* expression

$$-\frac{\sqrt{6}Q_2z(3x^2+3y^2-2z^2)}{12} - \frac{Q_3y(x^2+y^2-4z^2)}{4} + \frac{\sqrt{10}Q_3xz(x-y)(x+y)}{4} - \frac{\sqrt{10}Q_3yxyz}{2} - \frac{\sqrt{15}Q_{az}x(x^2-3y^2)}{12} + \frac{Q_{bz}x(x^2+y^2-4z^2)}{4}$$

$$\tilde{\mathbb{G}}_3^{(3,0)}[q](A'', 2)$$

\*\* symmetry

$$\frac{\sqrt{10}x(x^2-3y^2)}{4}$$

\*\* expression

$$\frac{\sqrt{6}Q_1z(3x^2+3y^2-2z^2)}{12} - \frac{Q_3x(x^2+y^2-4z^2)}{4} - \frac{\sqrt{10}Q_3xyz}{2} - \frac{\sqrt{10}Q_3yz(x-y)(x+y)}{4} + \frac{\sqrt{15}Q_{az}y(3x^2-y^2)}{12} - \frac{Q_{bz}y(x^2+y^2-4z^2)}{4}$$

$$\tilde{\mathbb{G}}_3^{(3,2)}[q](A'', 1)$$

\*\* symmetry

$$\frac{\sqrt{10}y(3x^2-y^2)}{4}$$

\*\* expression

$$-\frac{\sqrt{33}Q_2z(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{528} + \frac{\sqrt{22}Q_3y(25x^4-55x^2y^2+15x^2z^2+4y^4+15y^2z^2-10z^4)}{88} \\ + \frac{7\sqrt{55}Q_3xz(5x^4-18x^2y^2-4x^2z^2+y^4+4y^2z^2)}{176} + \frac{7\sqrt{55}Q_3yxyz(x^2-2y^2+z^2)}{22} \\ - \frac{7\sqrt{330}Q_{az}x(x^2-3y^2)(x^2+y^2-8z^2)}{528} + \frac{\sqrt{22}Q_{bz}x(13x^4-100x^2y^2-30x^2z^2+55y^4-30y^2z^2+20z^4)}{176}$$

$$\tilde{\mathbb{G}}_3^{(3,2)}[q](A'', 2)$$

\*\* symmetry

$$\frac{\sqrt{10}x(x^2-3y^2)}{4}$$

\*\* expression

$$\frac{\sqrt{33}Q_1z(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{528} + \frac{\sqrt{22}Q_3x(4x^4-55x^2y^2+15x^2z^2+25y^4+15y^2z^2-10z^4)}{88} \\ - \frac{7\sqrt{55}Q_3xyz(2x^2-y^2-z^2)}{22} + \frac{7\sqrt{55}Q_3yz(x^4-18x^2y^2+4x^2z^2+5y^4-4y^2z^2)}{176} \\ + \frac{7\sqrt{330}Q_{az}y(3x^2-y^2)(x^2+y^2-8z^2)}{528} - \frac{\sqrt{22}Q_{bz}y(55x^4-100x^2y^2-30x^2z^2+13y^4-30y^2z^2+20z^4)}{176}$$

$$\vec{\mathbb{G}}_{3,1}^{(3,-2)}[q](E'), \vec{\mathbb{G}}_{3,2}^{(3,-2)}[q](E')$$

\*\* symmetry

$$\sqrt{15}xyz$$

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

\*\* expression

$$\begin{aligned} & \frac{\sqrt{2}Q_1y}{4} + \frac{\sqrt{2}Q_2x}{4} + \frac{\sqrt{30}Q_{3xx}}{12} - \frac{\sqrt{30}Q_{3yy}}{12} - \frac{\sqrt{3}Q_{bzz}}{3} \\ & - \frac{\sqrt{2}Q_1x}{4} + \frac{\sqrt{2}Q_2y}{4} + \frac{\sqrt{3}Q_3z}{3} - \frac{\sqrt{30}Q_{3xy}}{12} - \frac{\sqrt{30}Q_{3yx}}{12} \end{aligned}$$

$$\vec{\mathbb{G}}_{3,1}^{(3,0)}[q](E'), \vec{\mathbb{G}}_{3,2}^{(3,0)}[q](E')$$

\*\* symmetry

$$\sqrt{15}xyz$$

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

\*\* expression

$$\begin{aligned} & \frac{Q_1y(x^2+y^2-4z^2)}{4} + \frac{Q_2x(x^2+y^2-4z^2)}{4} + \frac{\sqrt{15}Q_{3xx}(x^2-3y^2)}{12} + \frac{\sqrt{15}Q_{3yy}(3x^2-y^2)}{12} + \frac{\sqrt{10}Q_{azz}(x-y)(x+y)}{4} + \frac{\sqrt{6}Q_{bzz}(3x^2+3y^2-2z^2)}{12} \\ & - \frac{Q_1x(x^2+y^2-4z^2)}{4} + \frac{Q_2y(x^2+y^2-4z^2)}{4} - \frac{\sqrt{6}Q_3z(3x^2+3y^2-2z^2)}{12} - \frac{\sqrt{15}Q_{3xy}(3x^2-y^2)}{12} + \frac{\sqrt{15}Q_{3yx}(x^2-3y^2)}{12} - \frac{\sqrt{10}Q_{azxyz}}{2} \end{aligned}$$

$$\vec{\mathbb{G}}_{3,1}^{(3,2)}[q](E'), \vec{\mathbb{G}}_{3,2}^{(3,2)}[q](E')$$

\*\* symmetry

$$\sqrt{15}xyz$$

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

\*\* expression

$$\begin{aligned} & - \frac{\sqrt{22}Q_1y(25x^4-55x^2y^2+15x^2z^2+4y^4+15y^2z^2-10z^4)}{88} - \frac{\sqrt{22}Q_2x(4x^4-55x^2y^2+15x^2z^2+25y^4+15y^2z^2-10z^4)}{88} \\ & - \frac{\sqrt{330}Q_{3xx}(4x^4+x^2y^2-41x^2z^2-3y^4+15y^2z^2+18z^4)}{264} - \frac{\sqrt{330}Q_{3yy}(3x^4-x^2y^2-15x^2z^2-4y^4+41y^2z^2-18z^4)}{264} \\ & - \frac{7\sqrt{55}Q_{azz}(x-y)(x+y)(x^2+y^2-2z^2)}{44} + \frac{\sqrt{33}Q_{bzz}(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{132} \\ & - \frac{\sqrt{22}Q_1x(13x^4-100x^2y^2-30x^2z^2+55y^4-30y^2z^2+20z^4)}{176} + \frac{\sqrt{22}Q_2y(55x^4-100x^2y^2-30x^2z^2+13y^4-30y^2z^2+20z^4)}{176} \\ & - \frac{\sqrt{33}Q_3z(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{132} + \frac{\sqrt{330}Q_{3xy}(15x^4+16x^2y^2-138x^2z^2+y^4-26y^2z^2+36z^4)}{528} \\ & + \frac{\sqrt{330}Q_{3yx}(x^4+16x^2y^2-26x^2z^2+15y^4-138y^2z^2+36z^4)}{528} + \frac{7\sqrt{55}Q_{azxyz}(x^2+y^2-2z^2)}{22} \end{aligned}$$

$$\vec{\mathbb{G}}_{3,1}^{(3,-2)}[q](E''), \vec{\mathbb{G}}_{3,2}^{(3,-2)}[q](E'')$$

\*\* symmetry

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

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

\*\* expression

$$\begin{aligned} & - \frac{\sqrt{30}Q_3x}{12} + \frac{\sqrt{3}Q_{3yz}}{6} - \frac{\sqrt{2}Q_{azz}}{2} + \frac{\sqrt{30}Q_{bzy}}{12} \\ & \frac{\sqrt{30}Q_{3zy}}{12} - \frac{\sqrt{3}Q_{3xz}}{6} + \frac{\sqrt{2}Q_{azz}}{2} + \frac{\sqrt{30}Q_{bzx}}{12} \end{aligned}$$

$$\vec{\mathbb{G}}_{3,1}^{(3,0)}[q](E''), \vec{\mathbb{G}}_{3,2}^{(3,0)}[q](E'')$$

\*\* symmetry

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

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

\*\* expression

$$-\frac{\sqrt{10}Q_1z(x-y)(x+y)}{4} + \frac{\sqrt{10}Q_2xyz}{2} - \frac{\sqrt{15}Q_3x(x^2-3y^2)}{12} - \frac{\sqrt{6}Q_3yz(3x^2+3y^2-2z^2)}{12} + \frac{Q_{az}y(x^2+y^2-4z^2)}{4} + \frac{\sqrt{15}Q_{bz}y(3x^2-y^2)}{12}$$

$$\frac{\sqrt{10}Q_1xyz}{2} + \frac{\sqrt{10}Q_2z(x-y)(x+y)}{4} - \frac{\sqrt{15}Q_3y(3x^2-y^2)}{12} + \frac{\sqrt{6}Q_3xz(3x^2+3y^2-2z^2)}{12} - \frac{Q_{az}x(x^2+y^2-4z^2)}{4} - \frac{\sqrt{15}Q_{bz}x(x^2-3y^2)}{12}$$

$$\bar{\mathbb{G}}_{3,1}^{(3,2)}[q](E''), \bar{\mathbb{G}}_{3,2}^{(3,2)}[q](E'')$$

\*\* symmetry

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

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

\*\* expression

$$-\frac{7\sqrt{55}Q_1z(5x^4-18x^2y^2-4x^2z^2+y^4+4y^2z^2)}{176} + \frac{7\sqrt{55}Q_2xyz(2x^2-y^2-z^2)}{22}$$

$$+ \frac{\sqrt{330}Q_3x(4x^4+x^2y^2-41x^2z^2-3y^4+15y^2z^2+18z^4)}{264} + \frac{5\sqrt{33}Q_3yz(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{528}$$

$$-\frac{5\sqrt{22}Q_{az}y(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{176} - \frac{\sqrt{330}Q_{bz}y(15x^4+16x^2y^2-138x^2z^2+y^4-26y^2z^2+36z^4)}{528}$$

$$-\frac{7\sqrt{55}Q_1xyz(x^2-2y^2+z^2)}{22} - \frac{7\sqrt{55}Q_2z(x^4-18x^2y^2+4x^2z^2+5y^4-4y^2z^2)}{176}$$

$$+ \frac{\sqrt{330}Q_3y(3x^4-x^2y^2-15x^2z^2-4y^4+41y^2z^2-18z^4)}{264} - \frac{5\sqrt{33}Q_3xz(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{528}$$

$$+ \frac{5\sqrt{22}Q_{az}x(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{176} - \frac{\sqrt{330}Q_{bz}x(x^4+16x^2y^2-26x^2z^2+15y^4-138y^2z^2+36z^4)}{528}$$

\* Harmonics for rank 4

$$\bar{\mathbb{G}}_4^{(3,-2)}[q](A', 1)$$

\*\* symmetry

$$\frac{\sqrt{70}xz(x^2-3y^2)}{4}$$

\*\* expression

$$-\frac{3\sqrt{5}Q_1(x^2+y^2-2z^2)}{20} + \frac{\sqrt{30}Q_3xz}{20} - \frac{\sqrt{3}Q_3xy}{2} - \frac{\sqrt{3}Q_3y(x-y)(x+y)}{4} + \frac{\sqrt{30}Q_{bz}yz}{20}$$

$$\bar{\mathbb{G}}_4^{(3,-2)}[q](A', 2)$$

\*\* symmetry

$$\frac{\sqrt{70}yz(3x^2-y^2)}{4}$$

\*\* expression

$$\frac{3\sqrt{5}Q_2(x^2+y^2-2z^2)}{20} + \frac{\sqrt{30}Q_3yz}{20} + \frac{\sqrt{3}Q_3x(x-y)(x+y)}{4} - \frac{\sqrt{3}Q_3xy}{2} - \frac{\sqrt{30}Q_{bz}xz}{20}$$

$$\bar{\mathbb{G}}_4^{(3,0)}[q](A', 1)$$

\*\* symmetry

$$\frac{\sqrt{70}xz(x^2-3y^2)}{4}$$

\*\* expression

$$-\frac{\sqrt{110}Q_1(3x^4+6x^2y^2-24x^2z^2+3y^4-24y^2z^2+8z^4)}{176} - \frac{\sqrt{165}Q_3xz(3x^2+3y^2-4z^2)}{44} - \frac{\sqrt{66}Q_3xy(3x^2-4y^2+3z^2)}{22}$$

$$+ \frac{\sqrt{66}Q_3y(9x^4-42x^2y^2-12x^2z^2+5y^4+12y^2z^2)}{176} - \frac{7\sqrt{11}Q_{az}yz(3x^2-y^2)}{44} - \frac{\sqrt{165}Q_{bz}yz(3x^2+3y^2-4z^2)}{44}$$

$$\bar{\mathbb{G}}_4^{(3,0)}[q](A', 2)$$

\*\* symmetry

$$\frac{\sqrt{70}yz(3x^2 - y^2)}{4}$$

\*\* expression

$$\begin{aligned} & \frac{\sqrt{110}Q_2(3x^4 + 6x^2y^2 - 24x^2z^2 + 3y^4 - 24y^2z^2 + 8z^4)}{176} - \frac{\sqrt{165}Q_3yz(3x^2 + 3y^2 - 4z^2)}{44} + \frac{\sqrt{66}Q_{3x}(5x^4 - 42x^2y^2 + 12x^2z^2 + 9y^4 - 12y^2z^2)}{176} \\ & + \frac{\sqrt{66}Q_{3y}xy(4x^2 - 3y^2 - 3z^2)}{22} + \frac{7\sqrt{11}Q_{az}xz(x^2 - 3y^2)}{44} + \frac{\sqrt{165}Q_{bz}xz(3x^2 + 3y^2 - 4z^2)}{44} \end{aligned}$$

$$\bar{\mathbb{G}}_4^{(3,2)}[q](A', 1)$$

\*\* symmetry

$$\frac{\sqrt{70}xz(x^2 - 3y^2)}{4}$$

\*\* expression

$$\begin{aligned} & - \frac{3\sqrt{143}Q_1(19x^6 - 240x^4y^2 - 45x^4z^2 + 255x^2y^4 - 90x^2y^2z^2 + 60x^2z^4 - 14y^6 - 45y^4z^2 + 60y^2z^4 - 8z^6)}{2288} + \frac{9\sqrt{143}Q_2xy(x^2 - 3y^2)(3x^2 - y^2)}{208} \\ & - \frac{\sqrt{858}Q_{3xz}(13x^4 + 125x^2y^2 - 85x^2z^2 - 20y^4 - 85y^2z^2 + 34z^4)}{1144} + \frac{\sqrt{2145}Q_{3xy}(43x^4 + 26x^2y^2 - 508x^2z^2 - 17y^4 + 92y^2z^2 + 208z^4)}{2288} \\ & - \frac{\sqrt{2145}Q_{3y}(x^6 - 44x^4y^2 + 29x^4z^2 - 31x^2y^4 + 450x^2y^2z^2 - 104x^2z^4 + 14y^6 - 179y^4z^2 + 104y^2z^4)}{2288} \\ & + \frac{27\sqrt{1430}Q_{az}yz(3x^2 - y^2)(3x^2 + 3y^2 - 8z^2)}{2288} - \frac{\sqrt{858}Q_{bz}yz(125x^4 - 80x^2y^2 - 170x^2z^2 + 59y^4 - 170y^2z^2 + 68z^4)}{2288} \end{aligned}$$

$$\bar{\mathbb{G}}_4^{(3,2)}[q](A', 2)$$

\*\* symmetry

$$\frac{\sqrt{70}yz(3x^2 - y^2)}{4}$$

\*\* expression

$$\begin{aligned} & - \frac{9\sqrt{143}Q_1xy(x^2 - 3y^2)(3x^2 - y^2)}{208} - \frac{3\sqrt{143}Q_2(14x^6 - 255x^4y^2 + 45x^4z^2 + 240x^2y^4 + 90x^2y^2z^2 - 60x^2z^4 - 19y^6 + 45y^4z^2 - 60y^2z^4 + 8z^6)}{2288} \\ & + \frac{\sqrt{858}Q_{3yz}(20x^4 - 125x^2y^2 + 85x^2z^2 - 13y^4 + 85y^2z^2 - 34z^4)}{1144} \\ & - \frac{\sqrt{2145}Q_{3x}(14x^6 - 31x^4y^2 - 179x^4z^2 - 44x^2y^4 + 450x^2y^2z^2 + 104x^2z^4 + y^6 + 29y^4z^2 - 104y^2z^4)}{2288} \\ & - \frac{\sqrt{2145}Q_{3y}xy(17x^4 - 26x^2y^2 - 92x^2z^2 - 43y^4 + 508y^2z^2 - 208z^4)}{2288} - \frac{27\sqrt{1430}Q_{az}xz(x^2 - 3y^2)(3x^2 + 3y^2 - 8z^2)}{2288} \\ & + \frac{\sqrt{858}Q_{bz}xz(59x^4 - 80x^2y^2 - 170x^2z^2 + 125y^4 - 170y^2z^2 + 68z^4)}{2288} \end{aligned}$$

$$\bar{\mathbb{G}}_4^{(3,-2)}[q](A'')$$

\*\* symmetry

$$\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$$

\*\* expression

$$\frac{\sqrt{21}Q_3(x-y)(x+y)}{14} + \frac{\sqrt{210}Q_{3xyz}}{14} - \frac{\sqrt{210}Q_{3y}xz}{14} - \frac{\sqrt{21}Q_{bz}xy}{7}$$

$$\bar{\mathbb{G}}_4^{(3,0)}[q](A'')$$

\*\* symmetry

$$\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$$

\*\* expression

$$\begin{aligned} & \frac{5\sqrt{77}Q_1xz(x^2 - 3y^2)}{44} - \frac{5\sqrt{77}Q_2yz(3x^2 - y^2)}{44} + \frac{5\sqrt{462}Q_3(x-y)(x+y)(x^2 + y^2 - 6z^2)}{616} \\ & - \frac{3\sqrt{1155}Q_{3xyz}(3x^2 + 3y^2 - 4z^2)}{308} + \frac{3\sqrt{1155}Q_{3y}xz(3x^2 + 3y^2 - 4z^2)}{308} - \frac{5\sqrt{462}Q_{bz}xy(x^2 + y^2 - 6z^2)}{308} \end{aligned}$$

$$\bar{\mathbb{G}}_4^{(3,2)}[q](A'')$$

\*\* symmetry

$$\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$$

\*\* expression

$$\begin{aligned} & \frac{9\sqrt{10010}Q_1xz(x^2-3y^2)(3x^2+3y^2-8z^2)}{2288} - \frac{9\sqrt{10010}Q_2yz(3x^2-y^2)(3x^2+3y^2-8z^2)}{2288} \\ & - \frac{\sqrt{15015}Q_3(x-y)(x+y)(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{572} + \frac{5\sqrt{6006}Q_{3xyz}(5x^4+10x^2y^2-20x^2z^2+5y^4-20y^2z^2+8z^4)}{2288} \\ & - \frac{5\sqrt{6006}Q_{3yz}(5x^4+10x^2y^2-20x^2z^2+5y^4-20y^2z^2+8z^4)}{2288} + \frac{\sqrt{15015}Q_{bxyz}(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{286} \end{aligned}$$

$$\vec{\mathbb{G}}_{4,1}^{(3,-2)}[q](E'), \vec{\mathbb{G}}_{4,2}^{(3,-2)}[q](E')$$

\*\* symmetry

$$\begin{aligned} & - \frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4} \\ & \frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4} \end{aligned}$$

\*\* expression

$$\begin{aligned} & - \frac{3\sqrt{35}Q_1xy}{70} - \frac{3\sqrt{35}Q_2(x-y)(x+y)}{140} + \frac{\sqrt{210}Q_3yz}{20} - \frac{\sqrt{21}Q_{3x}(x^2-3y^2+2z^2)}{28} - \frac{\sqrt{21}Q_{3y}xy}{7} + \frac{3\sqrt{14}Q_{az}xz}{14} + \frac{\sqrt{210}Q_{bxyz}}{20} \\ & - \frac{3\sqrt{35}Q_1(x-y)(x+y)}{140} + \frac{3\sqrt{35}Q_2xy}{70} + \frac{\sqrt{210}Q_3xz}{20} - \frac{\sqrt{21}Q_{3x}xy}{7} + \frac{\sqrt{21}Q_{3y}(3x^2-y^2-2z^2)}{28} + \frac{3\sqrt{14}Q_{az}yz}{14} - \frac{\sqrt{210}Q_{bxyz}}{20} \end{aligned}$$

$$\vec{\mathbb{G}}_{4,1}^{(3,0)}[q](E'), \vec{\mathbb{G}}_{4,2}^{(3,0)}[q](E')$$

\*\* symmetry

$$\begin{aligned} & - \frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4} \\ & \frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4} \end{aligned}$$

\*\* expression

$$\begin{aligned} & \frac{\sqrt{770}Q_1xy(x^2-6y^2+15z^2)}{154} - \frac{\sqrt{770}Q_2(3x^4+42x^2y^2-60x^2z^2-17y^4+60y^2z^2)}{1232} \\ & - \frac{\sqrt{1155}Q_3yz(3x^2-y^2)}{44} - \frac{\sqrt{462}Q_{3x}(5x^4+18x^2y^2-48x^2z^2+13y^4-96y^2z^2+24z^4)}{1232} \\ & + \frac{\sqrt{462}Q_{3y}xy(x^2+y^2-6z^2)}{154} - \frac{9\sqrt{77}Q_{az}xz(3x^2+3y^2-4z^2)}{308} - \frac{\sqrt{1155}Q_{bxyz}(x^2-3y^2)}{44} \\ & - \frac{\sqrt{770}Q_1(17x^4-42x^2y^2-60x^2z^2-3y^4+60y^2z^2)}{1232} + \frac{\sqrt{770}Q_2xy(6x^2-y^2-15z^2)}{154} + \frac{\sqrt{1155}Q_{3xz}(x^2-3y^2)}{44} + \frac{\sqrt{462}Q_{3xyz}(x^2+y^2-6z^2)}{154} \\ & - \frac{\sqrt{462}Q_{3y}(13x^4+18x^2y^2-96x^2z^2+5y^4-48y^2z^2+24z^4)}{1232} - \frac{9\sqrt{77}Q_{az}yz(3x^2+3y^2-4z^2)}{308} - \frac{\sqrt{1155}Q_{bxyz}(3x^2-y^2)}{44} \end{aligned}$$

$$\vec{\mathbb{G}}_{4,1}^{(3,2)}[q](E'), \vec{\mathbb{G}}_{4,2}^{(3,2)}[q](E')$$

\*\* symmetry

$$\begin{aligned} & - \frac{\sqrt{10}yz(3x^2+3y^2-4z^2)}{4} \\ & \frac{\sqrt{10}xz(3x^2+3y^2-4z^2)}{4} \end{aligned}$$

\*\* expression

$$\begin{aligned} & \frac{3\sqrt{1001}Q_1xy(13x^4-10x^2y^2-100x^2z^2-23y^4+260y^2z^2-80z^4)}{2288} \\ & + \frac{3\sqrt{1001}Q_2(2x^6-25x^4y^2-5x^4z^2-20x^2y^4+270x^2y^2z^2-40x^2z^4+7y^6-85y^4z^2+40y^2z^4)}{2288} \\ & + \frac{\sqrt{6006}Q_{3yz}(20x^4-5x^2y^2-35x^2z^2-25y^4+85y^2z^2-22z^4)}{1144} \\ & + \frac{\sqrt{15015}Q_{3x}(2x^6+7x^4y^2-37x^4z^2+8x^2y^4-90x^2y^2z^2+52x^2z^4+3y^6-53y^4z^2+68y^2z^4-8z^6)}{2288} \\ & - \frac{\sqrt{15015}Q_{3y}xy(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{2288} + \frac{3\sqrt{10010}Q_{az}xz(5x^4+10x^2y^2-20x^2z^2+5y^4-20y^2z^2+8z^4)}{2288} \\ & - \frac{\sqrt{6006}Q_{bxyz}(5x^4+100x^2y^2-50x^2z^2+95y^4-290y^2z^2+44z^4)}{2288} \end{aligned}$$

$$\begin{aligned}
& - \frac{3\sqrt{1001}Q_1(7x^6 - 20x^4y^2 - 85x^4z^2 - 25x^2y^4 + 270x^2y^2z^2 + 40x^2z^4 + 2y^6 - 5y^4z^2 - 40y^2z^4)}{2288} \\
& + \frac{3\sqrt{1001}Q_2xy(23x^4 + 10x^2y^2 - 260x^2z^2 - 13y^4 + 100y^2z^2 + 80z^4)}{2288} \\
& - \frac{\sqrt{6006}Q_3xz(25x^4 + 5x^2y^2 - 85x^2z^2 - 20y^4 + 35y^2z^2 + 22z^4)}{1144} - \frac{\sqrt{15015}Q_{3x}xy(x^4 + 2x^2y^2 - 16x^2z^2 + y^4 - 16y^2z^2 + 16z^4)}{2288} \\
& + \frac{\sqrt{15015}Q_{3y}(3x^6 + 8x^4y^2 - 53x^4z^2 + 7x^2y^4 - 90x^2y^2z^2 + 68x^2z^4 + 2y^6 - 37y^4z^2 + 52y^2z^4 - 8z^6)}{2288} \\
& + \frac{3\sqrt{10010}Q_{az}yz(5x^4 + 10x^2y^2 - 20x^2z^2 + 5y^4 - 20y^2z^2 + 8z^4)}{2288} + \frac{\sqrt{6006}Q_{bz}yz(95x^4 + 100x^2y^2 - 290x^2z^2 + 5y^4 - 50y^2z^2 + 44z^4)}{2288}
\end{aligned}$$

$$\vec{\mathbb{G}}_{4,1}^{(3,-2)}[q](E'', 1), \vec{\mathbb{G}}_{4,2}^{(3,-2)}[q](E'', 1)$$

\*\* symmetry

$$\frac{\sqrt{35}(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$$

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

\*\* expression

$$\begin{aligned}
& \frac{3\sqrt{10}Q_1xz}{10} + \frac{3\sqrt{10}Q_2yz}{10} - \frac{\sqrt{15}Q_3(x - y)(x + y)}{10} - \frac{\sqrt{15}Q_{bz}xy}{5} \\
& \frac{3\sqrt{10}Q_1yz}{10} - \frac{3\sqrt{10}Q_2xz}{10} - \frac{\sqrt{15}Q_3xy}{5} + \frac{\sqrt{15}Q_{bz}(x - y)(x + y)}{10}
\end{aligned}$$

$$\vec{\mathbb{G}}_{4,1}^{(3,-2)}[q](E'', 2), \vec{\mathbb{G}}_{4,2}^{(3,-2)}[q](E'', 2)$$

\*\* symmetry

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

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

\*\* expression

$$\begin{aligned}
& -\frac{9\sqrt{70}Q_1xz}{140} + \frac{9\sqrt{70}Q_2yz}{140} - \frac{\sqrt{105}Q_3(x^2 + y^2 - 2z^2)}{35} - \frac{\sqrt{42}Q_{3x}yz}{28} - \frac{\sqrt{42}Q_{3y}xz}{28} - \frac{3\sqrt{7}Q_{az}xy}{7} \\
& -\frac{9\sqrt{70}Q_1yz}{140} - \frac{9\sqrt{70}Q_2xz}{140} - \frac{\sqrt{42}Q_{3x}xz}{28} + \frac{\sqrt{42}Q_{3y}yz}{28} - \frac{3\sqrt{7}Q_{az}(x - y)(x + y)}{14} - \frac{\sqrt{105}Q_{bz}(x^2 + y^2 - 2z^2)}{35}
\end{aligned}$$

$$\vec{\mathbb{G}}_{4,1}^{(3,0)}[q](E'', 1), \vec{\mathbb{G}}_{4,2}^{(3,0)}[q](E'', 1)$$

\*\* symmetry

$$\frac{\sqrt{35}(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$$

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

\*\* expression

$$\begin{aligned}
& \frac{\sqrt{55}Q_1xz(3x^2 + 3y^2 - 4z^2)}{44} + \frac{\sqrt{55}Q_2yz(3x^2 + 3y^2 - 4z^2)}{44} - \frac{\sqrt{330}Q_3(x - y)(x + y)(x^2 + y^2 - 6z^2)}{88} \\
& - \frac{7\sqrt{33}Q_{3x}yz(3x^2 - y^2)}{44} - \frac{7\sqrt{33}Q_{3y}xz(x^2 - 3y^2)}{44} + \frac{7\sqrt{22}Q_{az}xy(x - y)(x + y)}{22} - \frac{\sqrt{330}Q_{bz}xy(x^2 + y^2 - 6z^2)}{44} \\
& \frac{\sqrt{55}Q_1yz(3x^2 + 3y^2 - 4z^2)}{44} - \frac{\sqrt{55}Q_2xz(3x^2 + 3y^2 - 4z^2)}{44} - \frac{\sqrt{330}Q_3xy(x^2 + y^2 - 6z^2)}{44} + \frac{7\sqrt{33}Q_{3x}xz(x^2 - 3y^2)}{44} \\
& - \frac{7\sqrt{33}Q_{3y}yz(3x^2 - y^2)}{44} - \frac{7\sqrt{22}Q_{az}(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{88} + \frac{\sqrt{330}Q_{bz}(x - y)(x + y)(x^2 + y^2 - 6z^2)}{88}
\end{aligned}$$

$$\vec{\mathbb{G}}_{4,1}^{(3,0)}[q](E'', 2), \vec{\mathbb{G}}_{4,2}^{(3,0)}[q](E'', 2)$$

\*\* symmetry

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

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



\*\* expression

$$\begin{aligned}
& -\frac{5\sqrt{385}Q_1xz(3x^2+3y^2-4z^2)}{308} + \frac{5\sqrt{385}Q_2yz(3x^2+3y^2-4z^2)}{308} - \frac{\sqrt{2310}Q_3(x^4-12x^2y^2+6x^2z^2+y^4+6y^2z^2-2z^4)}{308} \\
& - \frac{\sqrt{231}Q_{3x}yz(27x^2-y^2-8z^2)}{308} + \frac{\sqrt{231}Q_{3y}xz(x^2-27y^2+8z^2)}{308} + \frac{13\sqrt{154}Q_{az}xy(x^2+y^2-6z^2)}{308} + \frac{\sqrt{2310}Q_{bz}xy(x-y)(x+y)}{44} \\
& - \frac{5\sqrt{385}Q_1yz(3x^2+3y^2-4z^2)}{308} - \frac{5\sqrt{385}Q_2xz(3x^2+3y^2-4z^2)}{308} + \frac{\sqrt{2310}Q_3xy(x-y)(x+y)}{44} - \frac{\sqrt{231}Q_{3x}xz(13x^2-15y^2-8z^2)}{308} \\
& - \frac{\sqrt{231}Q_{3y}yz(15x^2-13y^2+8z^2)}{308} + \frac{13\sqrt{154}Q_{az}(x-y)(x+y)(x^2+y^2-6z^2)}{616} + \frac{\sqrt{2310}Q_{bz}(5x^4-18x^2y^2-12x^2z^2+5y^4-12y^2z^2+4z^4)}{616}
\end{aligned}$$

$$\vec{\mathbb{G}}_{4,1}^{(3,2)}[q](E'', 1), \vec{\mathbb{G}}_{4,2}^{(3,2)}[q](E'', 1)$$

\*\* symmetry

$$\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$$

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

\*\* expression

$$\begin{aligned}
& \frac{3\sqrt{286}Q_1xz(5x^4+10x^2y^2-20x^2z^2+5y^4-20y^2z^2+8z^4)}{2288} + \frac{3\sqrt{286}Q_2yz(5x^4+10x^2y^2-20x^2z^2+5y^4-20y^2z^2+8z^4)}{2288} \\
& + \frac{\sqrt{429}Q_3(x-y)(x+y)(7x^4-118x^2y^2+20x^2z^2+7y^4+20y^2z^2-20z^4)}{572} \\
& - \frac{3\sqrt{4290}Q_{3x}yz(73x^4-98x^2y^2-48x^2z^2+5y^4+16y^2z^2)}{2288} + \frac{3\sqrt{4290}Q_{3y}xz(5x^4-98x^2y^2+16x^2z^2+73y^4-48y^2z^2)}{2288} \\
& + \frac{9\sqrt{715}Q_{az}xy(x-y)(x+y)(x^2+y^2-10z^2)}{286} - \frac{\sqrt{429}Q_{bz}xy(13x^4-40x^2y^2-10x^2z^2+13y^4-10y^2z^2+10z^4)}{143} \\
& \frac{3\sqrt{286}Q_1yz(5x^4+10x^2y^2-20x^2z^2+5y^4-20y^2z^2+8z^4)}{2288} - \frac{3\sqrt{286}Q_2xz(5x^4+10x^2y^2-20x^2z^2+5y^4-20y^2z^2+8z^4)}{2288} \\
& + \frac{\sqrt{429}Q_3xy(47x^4-170x^2y^2+40x^2z^2+47y^4+40y^2z^2-40z^4)}{572} + \frac{3\sqrt{4290}Q_{3x}xz(17x^4-122x^2y^2-16x^2z^2+37y^4+48y^2z^2)}{2288} \\
& + \frac{3\sqrt{4290}Q_{3y}yz(37x^4-122x^2y^2+48x^2z^2+17y^4-16y^2z^2)}{2288} - \frac{9\sqrt{715}Q_{az}(x^2+y^2-10z^2)(x^2-2xy-y^2)(x^2+2xy-y^2)}{1144} \\
& + \frac{\sqrt{429}Q_{bz}(x-y)(x+y)(19x^4-226x^2y^2-40x^2z^2+19y^4-40y^2z^2+40z^4)}{1144}
\end{aligned}$$

$$\vec{\mathbb{G}}_{4,1}^{(3,2)}[q](E'', 2), \vec{\mathbb{G}}_{4,2}^{(3,2)}[q](E'', 2)$$

\*\* symmetry

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

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

\*\* expression

$$\begin{aligned}
& -\frac{9\sqrt{2002}Q_1xz(4x^4-25x^2y^2-5x^2z^2+15y^4-5y^2z^2+2z^4)}{1144} + \frac{9\sqrt{2002}Q_2yz(15x^4-25x^2y^2-5x^2z^2+4y^4-5y^2z^2+2z^4)}{1144} \\
& + \frac{\sqrt{3003}Q_3(x^6-15x^4z^2+15x^2z^4+y^6-15y^4z^2+15y^2z^4-2z^6)}{286} \\
& + \frac{\sqrt{30030}Q_{3x}yz(13x^4+17x^2y^2-43x^2z^2+4y^4-19y^2z^2+10z^4)}{1144} + \frac{\sqrt{30030}Q_{3y}xz(4x^4+17x^2y^2-19x^2z^2+13y^4-43y^2z^2+10z^4)}{1144} \\
& - \frac{3\sqrt{5005}Q_{az}xy(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{572} - \frac{3\sqrt{3003}Q_{bz}xy(x-y)(x+y)(x^2+y^2-10z^2)}{572} \\
& \frac{9\sqrt{2002}Q_1yz(25x^4-60x^2y^2+10x^2z^2+3y^4+10y^2z^2-4z^4)}{2288} + \frac{9\sqrt{2002}Q_2xz(3x^4-60x^2y^2+10x^2z^2+25y^4+10y^2z^2-4z^4)}{2288} \\
& - \frac{3\sqrt{3003}Q_3xy(x-y)(x+y)(x^2+y^2-10z^2)}{572} + \frac{\sqrt{30030}Q_{3x}xz(17x^4+16x^2y^2-62x^2z^2-y^4-14y^2z^2+20z^4)}{2288} \\
& + \frac{\sqrt{30030}Q_{3y}yz(x^4-16x^2y^2+14x^2z^2-17y^4+62y^2z^2-20z^4)}{2288} - \frac{3\sqrt{5005}Q_{az}(x-y)(x+y)(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{1144} \\
& + \frac{\sqrt{3003}Q_{bz}(x^6+15x^4y^2-30x^4z^2+15x^2y^4-180x^2y^2z^2+60x^2z^4+y^6-30y^4z^2+60y^2z^4-8z^6)}{1144}
\end{aligned}$$