PG No. 17 $C_{3\mathrm{i}}$ $\bar{3}$ [trigonal] (polar, internal polar octupole)

* Harmonics for rank 0

$\vec{\mathbb{Q}}_0^{(3,3)}[q](A_g)$

** symmetry

$$1$$

** expression

$$\frac{\sqrt{70}Q_1 y\left(3x^2-y^2\right)}{28}+\frac{\sqrt{70}Q_2 x\left(x^2-3y^2\right)}{28}+\frac{\sqrt{105}Q_3 xyz}{7}-\frac{\sqrt{42}Q_{3x}x\left(x^2+y^2-4z^2\right)}{28}-\frac{\sqrt{42}Q_{3y}y\left(x^2+y^2-4z^2\right)}{28}-\frac{\sqrt{7}Q_{az}z\left(3x^2+3y^2-2z^2\right)}{14}+\frac{\sqrt{105}Q_{bz}z\left(x-y\right)\left(x+y\right)}{14}$$

* Harmonics for rank 1

$\vec{\mathbb{Q}}_1^{(3,1)}[q](A_u)$

** symmetry

$$z$$

** expression

$$\frac{\sqrt{21}Q_3 xy}{7}+\frac{2\sqrt{210}Q_{3x}xz}{35}+\frac{2\sqrt{210}Q_{3y}yz}{35}-\frac{3\sqrt{35}Q_{az}\left(x^2+y^2-2z^2\right)}{70}+\frac{\sqrt{21}Q_{bz}\left(x-y\right)\left(x+y\right)}{14}$$

$\vec{\mathbb{Q}}_1^{(3,3)}[q](A_u)$

** symmetry

$$z$$

** expression

$$\frac{\sqrt{210}Q_1 yz\left(3x^2-y^2\right)}{24}+\frac{\sqrt{210}Q_2 xz\left(x^2-3y^2\right)}{24}-\frac{\sqrt{35}Q_3 xy\left(x^2+y^2-6z^2\right)}{14}-\frac{5\sqrt{14}Q_{3x}xz\left(3x^2+3y^2-4z^2\right)}{56}-\frac{5\sqrt{14}Q_{3y}yz\left(3x^2+3y^2-4z^2\right)}{56}+\frac{\sqrt{21}Q_{az}\left(3x^4+6x^2y^2-24x^2z^2+3y^4-24y^2z^2+8z^4\right)}{84}-\frac{\sqrt{35}Q_{bz}\left(x-y\right)\left(x+y\right)\left(x^2+y^2-6z^2\right)}{28}$$

$\vec{\mathbb{Q}}_{1,1}^{(3,1)}[q](E_u)$, $\vec{\mathbb{Q}}_{1,2}^{(3,1)}[q](E_u)$

** symmetry

$$x$$

$$y$$

** expression

$$\frac{3\sqrt{14}Q_1 xy}{14}+\frac{3\sqrt{14}Q_2\left(x-y\right)\left(x+y\right)}{28}+\frac{\sqrt{21}Q_3 yz}{7}-\frac{\sqrt{210}Q_{3x}\left(3x^2+y^2-4z^2\right)}{140}-\frac{\sqrt{210}Q_{3y}xy}{70}-\frac{3\sqrt{35}Q_{az}xz}{35}+\frac{\sqrt{21}Q_{bz}xz}{7}$$

$$\frac{3\sqrt{14}Q_1\left(x-y\right)\left(x+y\right)}{28}-\frac{3\sqrt{14}Q_2 xy}{14}+\frac{\sqrt{21}Q_3 xz}{7}-\frac{\sqrt{210}Q_{3x}xy}{70}-\frac{\sqrt{210}Q_{3y}\left(x^2+3y^2-4z^2\right)}{140}-\frac{3\sqrt{35}Q_{az}yz}{35}-\frac{\sqrt{21}Q_{bz}yz}{7}$$

$\vec{\mathbb{Q}}_{1,1}^{(3,3)}[q](E_u)$, $\vec{\mathbb{Q}}_{1,2}^{(3,3)}[q](E_u)$

** symmetry

$$x$$

$$y$$

** expression

$$\frac{\sqrt{210}Q_1 xy\left(15x^2-13y^2-6z^2\right)}{168}+\frac{\sqrt{210}Q_2\left(4x^4-21x^2y^2-3x^2z^2+3y^4+3y^2z^2\right)}{168}+\frac{\sqrt{35}Q_3 yz\left(6x^2-y^2-z^2\right)}{14}-\frac{\sqrt{14}Q_{3x}\left(4x^4+3x^2y^2-27x^2z^2-y^4+3y^2z^2+4z^4\right)}{56}-\frac{5\sqrt{14}Q_{3y}xy\left(x^2+y^2-6z^2\right)}{56}-\frac{5\sqrt{21}Q_{az}xz\left(3x^2+3y^2-4z^2\right)}{84}+\frac{\sqrt{35}Q_{bz}xz\left(5x^2-9y^2-2z^2\right)}{28}$$

$$-\frac{\sqrt{210}Q_1\left(3x^4-21x^2y^2+3x^2z^2+4y^4-3y^2z^2\right)}{168}+\frac{\sqrt{210}Q_2 xy\left(13x^2-15y^2+6z^2\right)}{168}-\frac{\sqrt{35}Q_3 xz\left(x^2-6y^2+z^2\right)}{14}-\frac{5\sqrt{14}Q_{3x}xy\left(x^2+y^2-6z^2\right)}{56}+\frac{\sqrt{14}Q_{3y}\left(x^4-3x^2y^2-3x^2z^2-4y^4+27y^2z^2-4z^4\right)}{56}-\frac{5\sqrt{21}Q_{az}yz\left(3x^2+3y^2-4z^2\right)}{84}+\frac{\sqrt{35}Q_{bz}yz\left(9x^2-5y^2+2z^2\right)}{28}$$

* Harmonics for rank 2

$\vec{\mathbb{Q}}_2^{(3,-1)}[q](A_g)$

** symmetry

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

** expression

$$\frac{\sqrt{14} Q_{3x} x}{7} + \frac{\sqrt{14} Q_{3y} y}{7} + \frac{\sqrt{21} Q_{az} z}{7}$$

$\vec{\mathbb{Q}}_{2}^{(3,1)}[q](A_g)$

** symmetry

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

** expression

$$- \frac{5 \sqrt{210} Q_{1} y \left(3 x^{2} - y^{2}\right)}{168} - \frac{5 \sqrt{210} Q_{2} x \left(x^{2} - 3 y^{2}\right)}{168} - \frac{3 \sqrt{14} Q_{3x} x \left(x^{2} + y^{2} - 4 z^{2}\right)}{56} - \frac{3 \sqrt{14} Q_{3y} y \left(x^{2} + y^{2} - 4 z^{2}\right)}{56} - \frac{\sqrt{21} Q_{az} z \left(3 x^{2} + 3 y^{2} - 2 z^{2}\right)}{21}$$

$\vec{\mathbb{Q}}_{2}^{(3,3)}[q](A_g)$

** symmetry

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

** expression

$$\begin{aligned} &- \frac{\sqrt{1155} Q_{1} y \left(3 x^{2} - y^{2}\right) \left(x^{2} + y^{2} - 8 z^{2}\right)}{264} - \frac{\sqrt{1155} Q_{2} x \left(x^{2} - 3 y^{2}\right) \left(x^{2} + y^{2} - 8 z^{2}\right)}{264} - \frac{3 \sqrt{770} Q_{3} x y z \left(x^{2} + y^{2} - 2 z^{2}\right)}{44} \\ &+ \frac{15 \sqrt{77} Q_{3x} x \left(x^{4} + 2 x^{2} y^{2} - 12 x^{2} z^{2} + y^{4} - 12 y^{2} z^{2} + 8 z^{4}\right)}{616} + \frac{15 \sqrt{77} Q_{3y} y \left(x^{4} + 2 x^{2} y^{2} - 12 x^{2} z^{2} + y^{4} - 12 y^{2} z^{2} + 8 z^{4}\right)}{616} \\ &+ \frac{5 \sqrt{462} Q_{az} z \left(15 x^{4} + 30 x^{2} y^{2} - 40 x^{2} z^{2} + 15 y^{4} - 40 y^{2} z^{2} + 8 z^{4}\right)}{1848} - \frac{3 \sqrt{770} Q_{bz} z \left(x - y\right) \left(x + y\right) \left(x^{2} + y^{2} - 2 z^{2}\right)}{88} \end{aligned}$$

$\vec{\mathbb{Q}}_{2,1}^{(3,-1)}[q](E_g,1)$, $\vec{\mathbb{Q}}_{2,2}^{(3,-1)}[q](E_g,1)$

** symmetry

$$\sqrt{3} y z$$

$$- \sqrt{3} x z$$

** expression

$$\frac{\sqrt{105} Q_{3} x}{21} + \frac{2 \sqrt{42} Q_{3y} z}{21} - \frac{\sqrt{7} Q_{az} y}{7} - \frac{\sqrt{105} Q_{bz} y}{21}$$

$$- \frac{\sqrt{105} Q_{3} y}{21} - \frac{2 \sqrt{42} Q_{3x} z}{21} + \frac{\sqrt{7} Q_{az} x}{7} - \frac{\sqrt{105} Q_{bz} x}{21}$$

$\vec{\mathbb{Q}}_{2,1}^{(3,-1)}[q](E_g,2)$, $\vec{\mathbb{Q}}_{2,2}^{(3,-1)}[q](E_g,2)$

** symmetry

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

$$- \sqrt{3} x y$$

** expression

$$\frac{\sqrt{70} Q_{1} y}{14} + \frac{\sqrt{70} Q_{2} x}{14} - \frac{\sqrt{42} Q_{3x} x}{42} + \frac{\sqrt{42} Q_{3y} y}{42} + \frac{\sqrt{105} Q_{bz} z}{21}$$

$$- \frac{\sqrt{70} Q_{1} x}{14} + \frac{\sqrt{70} Q_{2} y}{14} - \frac{\sqrt{105} Q_{3} z}{21} + \frac{\sqrt{42} Q_{3x} y}{42} + \frac{\sqrt{42} Q_{3y} x}{42}$$

$\vec{\mathbb{Q}}_{2,1}^{(3,1)}[q](E_g,1)$, $\vec{\mathbb{Q}}_{2,2}^{(3,1)}[q](E_g,1)$

** symmetry

$$\sqrt{3} y z$$

$$- \sqrt{3} x z$$

** expression

$$\begin{aligned} &\frac{5 \sqrt{70} Q_{1} z \left(x - y\right) \left(x + y\right)}{56} - \frac{5 \sqrt{70} Q_{2} x y z}{28} - \frac{\sqrt{105} Q_{3} x \left(2 x^{2} - 3 y^{2} - 3 z^{2}\right)}{42} + \frac{5 \sqrt{42} Q_{3x} x y z}{28} \\ &- \frac{\sqrt{42} Q_{3y} z \left(21 x^{2} - 9 y^{2} - 4 z^{2}\right)}{168} - \frac{\sqrt{7} Q_{az} y \left(x^{2} + y^{2} - 4 z^{2}\right)}{28} + \frac{\sqrt{105} Q_{bz} y \left(9 x^{2} - y^{2} - 6 z^{2}\right)}{84} \end{aligned}$$

$$-\frac{5\sqrt{70}Q_{1}xyz}{28} - \frac{5\sqrt{70}Q_{2}z\left(x - y\right)\left(x + y\right)}{56} - \frac{\sqrt{105}Q_{3}y\left(3x^{2} - 2y^{2} + 3z^{2}\right)}{42} - \frac{\sqrt{42}Q_{3x}z\left(9x^{2} - 21y^{2} + 4z^{2}\right)}{168} - \frac{5\sqrt{42}Q_{3y}xyz}{28} + \frac{\sqrt{7}Q_{az}x\left(x^{2} + y^{2} - 4z^{2}\right)}{28} - \frac{\sqrt{105}Q_{bz}x\left(x^{2} - 9y^{2} + 6z^{2}\right)}{84}$$

$\vec{\mathbb{Q}}_{2,1}^{(3,1)}[q](E_g,2)$, $\vec{\mathbb{Q}}_{2,2}^{(3,1)}[q](E_g,2)$

** symmetry

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

$$-\sqrt{3}xy$$

** expression

$$\frac{\sqrt{70}Q_{1}y\left(x^{2} + y^{2} - 4z^{2}\right)}{56} + \frac{\sqrt{70}Q_{2}x\left(x^{2} + y^{2} - 4z^{2}\right)}{56} - \frac{\sqrt{42}Q_{3x}x\left(11x^{2} - 9y^{2} - 24z^{2}\right)}{168} - \frac{\sqrt{42}Q_{3y}y\left(9x^{2} - 11y^{2} + 24z^{2}\right)}{168} - \frac{5\sqrt{7}Q_{az}z\left(x - y\right)\left(x + y\right)}{14} + \frac{\sqrt{105}Q_{bz}z\left(3x^{2} + 3y^{2} - 2z^{2}\right)}{42}$$

$$-\frac{\sqrt{70}Q_{1}x\left(x^{2} + y^{2} - 4z^{2}\right)}{56} + \frac{\sqrt{70}Q_{2}y\left(x^{2} + y^{2} - 4z^{2}\right)}{56} - \frac{\sqrt{105}Q_{3}z\left(3x^{2} + 3y^{2} - 2z^{2}\right)}{42} + \frac{\sqrt{42}Q_{3x}y\left(21x^{2} + y^{2} - 24z^{2}\right)}{168} + \frac{\sqrt{42}Q_{3y}x\left(x^{2} + 21y^{2} - 24z^{2}\right)}{168} + \frac{5\sqrt{7}Q_{az}xyz}{7}$$

$\vec{\mathbb{Q}}_{2,1}^{(3,3)}[q](E_g,1)$, $\vec{\mathbb{Q}}_{2,2}^{(3,3)}[q](E_g,1)$

** symmetry

$$\sqrt{3}yz$$

$$-\sqrt{3}xz$$

** expression

$$-\frac{\sqrt{385}Q_{1}z\left(x^{4} - 9x^{2}y^{2} + x^{2}z^{2} + 2y^{4} - y^{2}z^{2}\right)}{44} + \frac{\sqrt{385}Q_{2}xyz\left(5x^{2} - 7y^{2} + 2z^{2}\right)}{44} + \frac{\sqrt{2310}Q_{3}x\left(x^{4} - 5x^{2}y^{2} - 5x^{2}z^{2} - 6y^{4} + 51y^{2}z^{2} - 6z^{4}\right)}{462} - \frac{5\sqrt{231}Q_{3x}xyz\left(x^{2} + y^{2} - 2z^{2}\right)}{44} + \frac{5\sqrt{231}Q_{3y}z\left(3x^{4} - 15x^{2}y^{2} - x^{2}z^{2} - 18y^{4} + 41y^{2}z^{2} - 4z^{4}\right)}{924} + \frac{5\sqrt{154}Q_{az}y\left(x^{4} + 2x^{2}y^{2} - 12x^{2}z^{2} + y^{4} - 12y^{2}z^{2} + 8z^{4}\right)}{308} - \frac{\sqrt{2310}Q_{bz}y\left(9x^{4} + 4x^{2}y^{2} - 66x^{2}z^{2} - 5y^{4} + 46y^{2}z^{2} - 12z^{4}\right)}{924}$$

$$-\frac{\sqrt{385}Q_{1}xyz\left(7x^{2} - 5y^{2} - 2z^{2}\right)}{44} - \frac{\sqrt{385}Q_{2}z\left(2x^{4} - 9x^{2}y^{2} - x^{2}z^{2} + y^{4} + y^{2}z^{2}\right)}{44} + \frac{\sqrt{2310}Q_{3}y\left(6x^{4} + 5x^{2}y^{2} - 51x^{2}z^{2} - y^{4} + 5y^{2}z^{2} + 6z^{4}\right)}{462} + \frac{5\sqrt{231}Q_{3x}z\left(18x^{4} + 15x^{2}y^{2} - 41x^{2}z^{2} - 3y^{4} + y^{2}z^{2} + 4z^{4}\right)}{924} + \frac{5\sqrt{231}Q_{3y}xyz\left(x^{2} + y^{2} - 2z^{2}\right)}{44} - \frac{5\sqrt{154}Q_{az}x\left(x^{4} + 2x^{2}y^{2} - 12x^{2}z^{2} + y^{4} - 12y^{2}z^{2} + 8z^{4}\right)}{308} + \frac{\sqrt{2310}Q_{bz}x\left(5x^{4} - 4x^{2}y^{2} - 46x^{2}z^{2} - 9y^{4} + 66y^{2}z^{2} + 12z^{4}\right)}{924}$$

$\vec{\mathbb{Q}}_{2,1}^{(3,3)}[q](E_g,2)$, $\vec{\mathbb{Q}}_{2,2}^{(3,3)}[q](E_g,2)$

** symmetry

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

$$-\sqrt{3}xy$$

** expression

$$\frac{\sqrt{385}Q_{1}y\left(53x^{4} - 104x^{2}y^{2} - 6x^{2}z^{2} + 11y^{4} - 6y^{2}z^{2} + 4z^{4}\right)}{616} + \frac{\sqrt{385}Q_{2}x\left(11x^{4} - 104x^{2}y^{2} - 6x^{2}z^{2} + 53y^{4} - 6y^{2}z^{2} + 4z^{4}\right)}{616} + \frac{3\sqrt{2310}Q_{3}xyz\left(x - y\right)\left(x + y\right)}{44} - \frac{5\sqrt{231}Q_{3x}x\left(5x^{4} - 4x^{2}y^{2} - 46x^{2}z^{2} - 9y^{4} + 66y^{2}z^{2} + 12z^{4}\right)}{1848} - \frac{5\sqrt{231}Q_{3y}y\left(9x^{4} + 4x^{2}y^{2} - 66x^{2}z^{2} - 5y^{4} + 46y^{2}z^{2} - 12z^{4}\right)}{1848} - \frac{5\sqrt{154}Q_{az}z\left(x - y\right)\left(x + y\right)\left(x^{2} + y^{2} - 2z^{2}\right)}{88} + \frac{\sqrt{2310}Q_{bz}z\left(39x^{4} - 174x^{2}y^{2} - 20x^{2}z^{2} + 39y^{4} - 20y^{2}z^{2} + 4z^{4}\right)}{1848}$$

$$\frac{\sqrt{385}Q_{1}x\left(5x^{4} - 53x^{2}y^{2} + 3x^{2}z^{2} + 26y^{4} + 3y^{2}z^{2} - 2z^{4}\right)}{308} - \frac{\sqrt{385}Q_{2}y\left(26x^{4} - 53x^{2}y^{2} + 3x^{2}z^{2} + 5y^{4} + 3y^{2}z^{2} - 2z^{4}\right)}{308} + \frac{\sqrt{2310}Q_{3}z\left(6x^{4} - 51x^{2}y^{2} + 5x^{2}z^{2} + 6y^{4} + 5y^{2}z^{2} - z^{4}\right)}{462} + \frac{5\sqrt{231}Q_{3x}y\left(6x^{4} + 5x^{2}y^{2} - 51x^{2}z^{2} - y^{4} + 5y^{2}z^{2} + 6z^{4}\right)}{924} - \frac{5\sqrt{231}Q_{3y}x\left(x^{4} - 5x^{2}y^{2} - 5x^{2}z^{2} - 6y^{4} + 51y^{2}z^{2} - 6z^{4}\right)}{924} + \frac{5\sqrt{154}Q_{az}xyz\left(x^{2} + y^{2} - 2z^{2}\right)}{44} - \frac{3\sqrt{2310}Q_{bz}xyz\left(x - y\right)\left(x + y\right)}{44}$$

* Harmonics for rank 3

$\vec{\mathbb{Q}}_3^{(3,-3)}[q](A_u,1)$

** symmetry

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

** expression

$$Q_{az}$$

$\vec{\mathbb{Q}}_3^{(3,-3)}[q](A_u,2)$

** symmetry

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

** expression

$$Q_1$$

$\vec{\mathbb{Q}}_3^{(3,-3)}[q](A_u,3)$

** symmetry

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

** expression

$$Q_2$$

$\vec{\mathbb{Q}}_3^{(3,-1)}[q](A_u,1)$

** symmetry

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

** expression

$$-Q_3xy+\frac{\sqrt{10}Q_{3x}xz}{10}+\frac{\sqrt{10}Q_{3y}yz}{10}-\frac{\sqrt{15}Q_{az}\left(x^2+y^2-2z^2\right)}{15}-\frac{Q_{bz}\left(x-y\right)\left(x+y\right)}{2}$$

$\vec{\mathbb{Q}}_3^{(3,-1)}[q](A_u,2)$

** symmetry

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

** expression

$$\frac{\sqrt{15}Q_1\left(x^2+y^2-2z^2\right)}{12}+\frac{\sqrt{10}Q_3xz}{4}-\frac{Q_{3x}xy}{2}-\frac{Q_{3y}\left(x-y\right)\left(x+y\right)}{4}+\frac{\sqrt{10}Q_{bz}yz}{4}$$

$\vec{\mathbb{Q}}_3^{(3,-1)}[q](A_u,3)$

** symmetry

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

** expression

$$\frac{\sqrt{15}Q_2\left(x^2+y^2-2z^2\right)}{12}-\frac{\sqrt{10}Q_3yz}{4}-\frac{Q_{3x}\left(x-y\right)\left(x+y\right)}{4}+\frac{Q_{3y}xy}{2}+\frac{\sqrt{10}Q_{bz}xz}{4}$$

$\vec{\mathbb{Q}}_3^{(3,1)}[q](A_u,1)$

** symmetry

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

** expression

$$-\frac{7\sqrt{55}Q_1yz\left(3x^2-y^2\right)}{44}-\frac{7\sqrt{55}Q_2xz\left(x^2-3y^2\right)}{44}+\frac{\sqrt{330}Q_3xy\left(x^2+y^2-6z^2\right)}{132}-\frac{5\sqrt{33}Q_{3x}xz\left(3x^2+3y^2-4z^2\right)}{132}$$
$$-\frac{5\sqrt{33}Q_{3y}yz\left(3x^2+3y^2-4z^2\right)}{132}+\frac{\sqrt{22}Q_{az}\left(3x^4+6x^2y^2-24x^2z^2+3y^4-24y^2z^2+8z^4\right)}{88}+\frac{\sqrt{330}Q_{bz}\left(x-y\right)\left(x+y\right)\left(x^2+y^2-6z^2\right)}{264}$$

$\vec{\mathbb{Q}}_3^{(3,1)}[q](A_u,2)$

** symmetry

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

** expression

$$\frac{\sqrt{22}Q_1\left(3x^4+6x^2y^2-24x^2z^2+3y^4-24y^2z^2+8z^4\right)}{176}+\frac{5\sqrt{33}Q_3xz\left(3x^2+3y^2-4z^2\right)}{132}-\frac{\sqrt{330}Q_{3x}xy\left(5x^2-2y^2-9z^2\right)}{66}+\frac{\sqrt{330}Q_{3y}\left(x^4-42x^2y^2+36x^2z^2+13y^4-36y^2z^2\right)}{528}-\frac{7\sqrt{55}Q_{az}yz\left(3x^2-y^2\right)}{44}+\frac{5\sqrt{33}Q_{bz}yz\left(3x^2+3y^2-4z^2\right)}{132}$$

$\vec{\mathbb{Q}}_3^{(3,1)}[q](A_u,3)$
** symmetry

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

** expression

$$\frac{\sqrt{22}Q_2\left(3x^4+6x^2y^2-24x^2z^2+3y^4-24y^2z^2+8z^4\right)}{176}-\frac{5\sqrt{33}Q_3yz\left(3x^2+3y^2-4z^2\right)}{132}-\frac{\sqrt{330}Q_{3x}\left(13x^4-42x^2y^2-36x^2z^2+y^4+36y^2z^2\right)}{528}-\frac{\sqrt{330}Q_{3y}xy\left(2x^2-5y^2+9z^2\right)}{66}-\frac{7\sqrt{55}Q_{az}xz\left(x^2-3y^2\right)}{44}+\frac{5\sqrt{33}Q_{bz}xz\left(3x^2+3y^2-4z^2\right)}{132}$$

$\vec{\mathbb{Q}}_3^{(3,3)}[q](A_u,1)$
** symmetry

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

** expression

$$-\frac{7\sqrt{4290}Q_1yz\left(3x^2-y^2\right)\left(3x^2+3y^2-8z^2\right)}{2288}-\frac{7\sqrt{4290}Q_2xz\left(x^2-3y^2\right)\left(3x^2+3y^2-8z^2\right)}{2288}+\frac{7\sqrt{715}Q_3xy\left(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4\right)}{572}+\frac{35\sqrt{286}Q_{3x}xz\left(5x^4+10x^2y^2-20x^2z^2+5y^4-20y^2z^2+8z^4\right)}{2288}+\frac{35\sqrt{286}Q_{3y}yz\left(5x^4+10x^2y^2-20x^2z^2+5y^4-20y^2z^2+8z^4\right)}{2288}-\frac{5\sqrt{429}Q_{az}\left(5x^6+15x^4y^2-90x^4z^2+15x^2y^4-180x^2y^2z^2+120x^2z^4+5y^6-90y^4z^2+120y^2z^4-16z^6\right)}{3432}+\frac{7\sqrt{715}Q_{bz}\left(x-y\right)\left(x+y\right)\left(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4\right)}{1144}$$

$\vec{\mathbb{Q}}_3^{(3,3)}[q](A_u,2)$
** symmetry

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

** expression

$$-\frac{\sqrt{429}Q_1\left(113x^6-1740x^4y^2+45x^4z^2+1725x^2y^4+90x^2y^2z^2-60x^2z^4-118y^6+45y^4z^2-60y^2z^4+8z^6\right)}{6864}+\frac{7\sqrt{429}Q_2xy\left(x^2-3y^2\right)\left(3x^2-y^2\right)}{208}-\frac{7\sqrt{286}Q_3xz\left(7x^4-85x^2y^2+5x^2z^2+40y^4+5y^2z^2-2z^4\right)}{1144}-\frac{7\sqrt{715}Q_{3x}xy\left(7x^4+2x^2y^2-76x^2z^2-5y^4+44y^2z^2+16z^4\right)}{2288}+\frac{7\sqrt{715}Q_{3y}\left(x^6-8x^4y^2-7x^4z^2-7x^2y^4+90x^2y^2z^2-8x^2z^4+2y^6-23y^4z^2+8y^2z^4\right)}{2288}-\frac{7\sqrt{4290}Q_{az}yz\left(3x^2-y^2\right)\left(3x^2+3y^2-8z^2\right)}{2288}+\frac{7\sqrt{286}Q_{bz}yz\left(85x^4-160x^2y^2-10x^2z^2+19y^4-10y^2z^2+4z^4\right)}{2288}$$

$\vec{\mathbb{Q}}_3^{(3,3)}[q](A_u,3)$
** symmetry

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

** expression

$$\frac{7\sqrt{429}Q_1xy\left(x^2-3y^2\right)\left(3x^2-y^2\right)}{208}+\frac{\sqrt{429}Q_2\left(118x^6-1725x^4y^2-45x^4z^2+1740x^2y^4-90x^2y^2z^2+60x^2z^4-113y^6-45y^4z^2+60y^2z^4-8z^6\right)}{6864}+\frac{7\sqrt{286}Q_3yz\left(40x^4-85x^2y^2+5x^2z^2+7y^4+5y^2z^2-2z^4\right)}{1144}-\frac{7\sqrt{715}Q_{3x}\left(2x^6-7x^4y^2-23x^4z^2-8x^2y^4+90x^2y^2z^2+8x^2z^4+y^6-7y^4z^2-8y^2z^4\right)}{2288}-\frac{7\sqrt{715}Q_{3y}xy\left(5x^4-2x^2y^2-44x^2z^2-7y^4+76y^2z^2-16z^4\right)}{2288}-\frac{7\sqrt{4290}Q_{az}xz\left(x^2-3y^2\right)\left(3x^2+3y^2-8z^2\right)}{2288}+\frac{7\sqrt{286}Q_{bz}xz\left(19x^4-160x^2y^2-10x^2z^2+85y^4-10y^2z^2+4z^4\right)}{2288}$$

$\vec{\mathbb{Q}}_{3,1}^{(3,-3)}[q](E_u,1)$, $\vec{\mathbb{Q}}_{3,2}^{(3,-3)}[q](E_u,1)$

** symmetry

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

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

** expression

$$Q_{3x}$$

$$Q_{3y}$$

$\vec{\mathbb{Q}}_{3,1}^{(3,-3)}[q](E_u,2)$, $\vec{\mathbb{Q}}_{3,2}^{(3,-3)}[q](E_u,2)$
** symmetry

$$\sqrt{15}xyz$$

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

** expression

$$Q_3$$

$$Q_{bz}$$

$\vec{\mathbb{Q}}_{3,1}^{(3,-1)}[q](E_u,1)$, $\vec{\mathbb{Q}}_{3,2}^{(3,-1)}[q](E_u,1)$
** symmetry

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

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

** expression

$$-\frac{Q_1xy}{2}-\frac{Q_2\left(x-y\right)\left(x+y\right)}{4}+\frac{\sqrt{6}Q_3yz}{4}+\frac{\sqrt{15}Q_{3x}\left(x^2-3y^2+2z^2\right)}{20}+\frac{\sqrt{15}Q_{3y}xy}{5}+\frac{\sqrt{10}Q_{az}xz}{10}+\frac{\sqrt{6}Q_{bz}xz}{4}$$

$$-\frac{Q_1\left(x-y\right)\left(x+y\right)}{4}+\frac{Q_2xy}{2}+\frac{\sqrt{6}Q_3xz}{4}+\frac{\sqrt{15}Q_{3x}xy}{5}-\frac{\sqrt{15}Q_{3y}\left(3x^2-y^2-2z^2\right)}{20}+\frac{\sqrt{10}Q_{az}yz}{10}-\frac{\sqrt{6}Q_{bz}yz}{4}$$

$\vec{\mathbb{Q}}_{3,1}^{(3,-1)}[q](E_u,2)$, $\vec{\mathbb{Q}}_{3,2}^{(3,-1)}[q](E_u,2)$
** symmetry

$$\sqrt{15}xyz$$

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

** expression

$$\frac{\sqrt{10}Q_1xz}{4}-\frac{\sqrt{10}Q_2yz}{4}+\frac{\sqrt{6}Q_{3x}yz}{4}+\frac{\sqrt{6}Q_{3y}xz}{4}-Q_{az}xy$$

$$\frac{\sqrt{10}Q_1yz}{4}+\frac{\sqrt{10}Q_2xz}{4}+\frac{\sqrt{6}Q_{3x}xz}{4}-\frac{\sqrt{6}Q_{3y}yz}{4}-\frac{Q_{az}\left(x-y\right)\left(x+y\right)}{2}$$

$\vec{\mathbb{Q}}_{3,1}^{(3,1)}[q](E_u,1)$, $\vec{\mathbb{Q}}_{3,2}^{(3,1)}[q](E_u,1)$
** symmetry

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

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

** expression

$$-\frac{\sqrt{330}Q_1xy\left(5x^2-2y^2-9z^2\right)}{66}-\frac{\sqrt{330}Q_2\left(13x^4-42x^2y^2-36x^2z^2+y^4+36y^2z^2\right)}{528}$$
$$+\frac{\sqrt{55}Q_3yz\left(9x^2-19y^2+16z^2\right)}{132}-\frac{\sqrt{22}Q_{3x}\left(17x^4-6x^2y^2-96x^2z^2-23y^4+144y^2z^2-8z^4\right)}{528}$$
$$-\frac{5\sqrt{22}Q_{3y}xy\left(x^2+y^2-6z^2\right)}{66}-\frac{5\sqrt{33}Q_{az}xz\left(3x^2+3y^2-4z^2\right)}{132}-\frac{\sqrt{55}Q_{bz}xz\left(5x^2+33y^2-16z^2\right)}{132}$$

$$\frac{\sqrt{330}Q_1\left(x^4-42x^2y^2+36x^2z^2+13y^4-36y^2z^2\right)}{528}-\frac{\sqrt{330}Q_2xy\left(2x^2-5y^2+9z^2\right)}{66}-\frac{\sqrt{55}Q_3xz\left(19x^2-9y^2-16z^2\right)}{132}-\frac{5\sqrt{22}Q_{3x}xy\left(x^2+y^2-6z^2\right)}{66}$$
$$+\frac{\sqrt{22}Q_{3y}\left(23x^4+6x^2y^2-144x^2z^2-17y^4+96y^2z^2+8z^4\right)}{528}-\frac{5\sqrt{33}Q_{az}yz\left(3x^2+3y^2-4z^2\right)}{132}+\frac{\sqrt{55}Q_{bz}yz\left(33x^2+5y^2-16z^2\right)}{132}$$

$\vec{\mathbb{Q}}_{3,1}^{(3,1)}[q](E_u,2)$, $\vec{\mathbb{Q}}_{3,2}^{(3,1)}[q](E_u,2)$

** symmetry

$$\sqrt{15}xyz$$

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

** expression

$$\frac{5\sqrt{33}Q_1xz\left(3x^2+3y^2-4z^2\right)}{132}-\frac{5\sqrt{33}Q_2yz\left(3x^2+3y^2-4z^2\right)}{132}-\frac{7\sqrt{22}Q_3\left(x^4-3x^2y^2-3x^2z^2+y^4-3y^2z^2+z^4\right)}{66}$$
$$+\frac{\sqrt{55}Q_{3x}yz\left(9x^2-19y^2+16z^2\right)}{132}-\frac{\sqrt{55}Q_{3y}xz\left(19x^2-9y^2-16z^2\right)}{132}+\frac{\sqrt{330}Q_{az}xy\left(x^2+y^2-6z^2\right)}{132}+\frac{35\sqrt{22}Q_{bz}xy\left(x-y\right)\left(x+y\right)}{132}$$

$$\frac{5\sqrt{33}Q_1yz\left(3x^2+3y^2-4z^2\right)}{132}+\frac{5\sqrt{33}Q_2xz\left(3x^2+3y^2-4z^2\right)}{132}+\frac{35\sqrt{22}Q_3xy\left(x-y\right)\left(x+y\right)}{132}-\frac{\sqrt{55}Q_{3x}xz\left(5x^2+33y^2-16z^2\right)}{132}$$
$$+\frac{\sqrt{55}Q_{3y}yz\left(33x^2+5y^2-16z^2\right)}{132}+\frac{\sqrt{330}Q_{az}\left(x-y\right)\left(x+y\right)\left(x^2+y^2-6z^2\right)}{264}+\frac{7\sqrt{22}Q_{bz}\left(x^4-18x^2y^2+12x^2z^2+y^4+12y^2z^2-4z^4\right)}{264}$$

$\vec{\mathbb{Q}}_{3,1}^{(3,3)}[q](E_u,1)$, $\vec{\mathbb{Q}}_{3,2}^{(3,3)}[q](E_u,1)$

** symmetry

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

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

** expression

$$-\frac{7\sqrt{715}Q_1xy\left(7x^4+2x^2y^2-76x^2z^2-5y^4+44y^2z^2+16z^4\right)}{2288}$$
$$-\frac{7\sqrt{715}Q_2\left(2x^6-7x^4y^2-23x^4z^2-8x^2y^4+90x^2y^2z^2+8x^2z^4+y^6-7y^4z^2-8y^2z^4\right)}{2288}-\frac{7\sqrt{4290}Q_3yz\left(8x^4+7x^2y^2-23x^2z^2-y^4+y^2z^2+2z^4\right)}{1144}$$
$$+\frac{5\sqrt{429}Q_{3x}\left(6x^6+11x^4y^2-101x^4z^2+4x^2y^4-90x^2y^2z^2+116x^2z^4-y^6+11y^4z^2+4y^2z^4-8z^6\right)}{2288}$$
$$+\frac{35\sqrt{429}Q_{3y}xy\left(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4\right)}{2288}+\frac{35\sqrt{286}Q_{az}xz\left(5x^4+10x^2y^2-20x^2z^2+5y^4-20y^2z^2+8z^4\right)}{2288}$$
$$-\frac{7\sqrt{4290}Q_{bz}xz\left(7x^4-4x^2y^2-22x^2z^2-11y^4+26y^2z^2+4z^4\right)}{2288}$$

$$\frac{7\sqrt{715}Q_1\left(x^6-8x^4y^2-7x^4z^2-7x^2y^4+90x^2y^2z^2-8x^2z^4+2y^6-23y^4z^2+8y^2z^4\right)}{2288}$$
$$-\frac{7\sqrt{715}Q_2xy\left(5x^4-2x^2y^2-44x^2z^2-7y^4+76y^2z^2-16z^4\right)}{2288}$$
$$+\frac{7\sqrt{4290}Q_3xz\left(x^4-7x^2y^2-x^2z^2-8y^4+23y^2z^2-2z^4\right)}{1144}+\frac{35\sqrt{429}Q_{3x}xy\left(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4\right)}{2288}$$
$$-\frac{5\sqrt{429}Q_{3y}\left(x^6-4x^4y^2-11x^4z^2-11x^2y^4+90x^2y^2z^2-4x^2z^4-6y^6+101y^4z^2-116y^2z^4+8z^6\right)}{2288}$$
$$+\frac{35\sqrt{286}Q_{az}yz\left(5x^4+10x^2y^2-20x^2z^2+5y^4-20y^2z^2+8z^4\right)}{2288}-\frac{7\sqrt{4290}Q_{bz}yz\left(11x^4+4x^2y^2-26x^2z^2-7y^4+22y^2z^2-4z^4\right)}{2288}$$

$\vec{\mathbb{Q}}_{3,1}^{(3,3)}[q](E_u,2)$, $\vec{\mathbb{Q}}_{3,2}^{(3,3)}[q](E_u,2)$

** symmetry

$$\sqrt{15}xyz$$

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

** expression

$$-\frac{7\sqrt{286}Q_1xz\left(7x^4-85x^2y^2+5x^2z^2+40y^4+5y^2z^2-2z^4\right)}{1144}+\frac{7\sqrt{286}Q_2yz\left(40x^4-85x^2y^2+5x^2z^2+7y^4+5y^2z^2-2z^4\right)}{1144}$$
$$+\frac{\sqrt{429}Q_3\left(2x^6-15x^4y^2-15x^4z^2-15x^2y^4+180x^2y^2z^2-15x^2z^4+2y^6-15y^4z^2-15y^2z^4+2z^6\right)}{286}$$
$$-\frac{7\sqrt{4290}Q_{3x}yz\left(8x^4+7x^2y^2-23x^2z^2-y^4+y^2z^2+2z^4\right)}{1144}+\frac{7\sqrt{4290}Q_{3y}xz\left(x^4-7x^2y^2-x^2z^2-8y^4+23y^2z^2-2z^4\right)}{1144}$$
$$+\frac{7\sqrt{715}Q_{az}xy\left(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4\right)}{572}-\frac{21\sqrt{429}Q_{bz}xy\left(x-y\right)\left(x+y\right)\left(x^2+y^2-10z^2\right)}{572}$$

$$\frac{7\sqrt{286}Q_1yz\left(85x^4-160x^2y^2-10x^2z^2+19y^4-10y^2z^2+4z^4\right)}{2288}+\frac{7\sqrt{286}Q_2xz\left(19x^4-160x^2y^2-10x^2z^2+85y^4-10y^2z^2+4z^4\right)}{2288}$$
$$-\frac{21\sqrt{429}Q_3xy\left(x-y\right)\left(x+y\right)\left(x^2+y^2-10z^2\right)}{572}-\frac{7\sqrt{4290}Q_{3x}xz\left(7x^4-4x^2y^2-22x^2z^2-11y^4+26y^2z^2+4z^4\right)}{2288}$$
$$-\frac{7\sqrt{4290}Q_{3y}yz\left(11x^4+4x^2y^2-26x^2z^2-7y^4+22y^2z^2-4z^4\right)}{2288}+\frac{7\sqrt{715}Q_{az}\left(x-y\right)\left(x+y\right)\left(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4\right)}{1144}$$
$$-\frac{\sqrt{429}Q_{bz}\left(13x^6-45x^4y^2-150x^4z^2-45x^2y^4+540x^2y^2z^2+60x^2z^4+13y^6-150y^4z^2+60y^2z^4-8z^6\right)}{1144}$$

* Harmonics for rank 4

$\vec{\mathbb{Q}}_4^{(3,-3)}[q](A_g,1)$

** symmetry

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

** expression

$$-\frac{\sqrt{42}Q_{3x}x}{14}-\frac{\sqrt{42}Q_{3y}y}{14}+\frac{2\sqrt{7}Q_{az}z}{7}$$

$\vec{\mathbb{Q}}_4^{(3,-3)}[q](A_g,2)$

** symmetry

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

** expression

$$\frac{Q_2z}{2}-\frac{\sqrt{6}Q_3y}{4}+\frac{\sqrt{6}Q_{bz}x}{4}$$

$\vec{\mathbb{Q}}_4^{(3,-3)}[q](A_g,3)$

** symmetry

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

** expression

$$\frac{Q_1z}{2}+\frac{\sqrt{6}Q_3x}{4}+\frac{\sqrt{6}Q_{bz}y}{4}$$

$\vec{\mathbb{Q}}_4^{(3,-1)}[q](A_g,1)$

** symmetry

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

** expression

$$\frac{3\sqrt{385}Q_1y\left(3x^2-y^2\right)}{308}+\frac{3\sqrt{385}Q_2x\left(x^2-3y^2\right)}{308}-\frac{\sqrt{2310}Q_3xyz}{22}-\frac{\sqrt{231}Q_{3x}x\left(x^2+y^2-4z^2\right)}{308}$$
$$-\frac{\sqrt{231}Q_{3y}y\left(x^2+y^2-4z^2\right)}{308}-\frac{3\sqrt{154}Q_{az}z\left(3x^2+3y^2-2z^2\right)}{154}-\frac{\sqrt{2310}Q_{bz}z\left(x-y\right)\left(x+y\right)}{44}$$

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

** symmetry

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

** expression

$$\frac{3\sqrt{22}Q_2z\left(3x^2+3y^2-2z^2\right)}{44}+\frac{\sqrt{33}Q_3y\left(x^2+y^2-4z^2\right)}{44}+\frac{\sqrt{330}Q_{3x}z\left(x-y\right)\left(x+y\right)}{44}$$
$$-\frac{\sqrt{330}Q_{3y}xyz}{22}-\frac{3\sqrt{55}Q_{az}x\left(x^2-3y^2\right)}{44}-\frac{\sqrt{33}Q_{bz}x\left(x^2+y^2-4z^2\right)}{44}$$

$\vec{\mathbb{Q}}_4^{(3,-1)}[q](A_g,3)$

** symmetry

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

** expression

$$\frac{3\sqrt{22}Q_1z\left(3x^2+3y^2-2z^2\right)}{44}-\frac{\sqrt{33}Q_3x\left(x^2+y^2-4z^2\right)}{44}+\frac{\sqrt{330}Q_{3x}xyz}{22}$$
$$+\frac{\sqrt{330}Q_{3y}z\left(x-y\right)\left(x+y\right)}{44}-\frac{3\sqrt{55}Q_{az}y\left(3x^2-y^2\right)}{44}-\frac{\sqrt{33}Q_{bz}y\left(x^2+y^2-4z^2\right)}{44}$$

$\vec{\mathbb{Q}}_4^{(3,1)}[q](A_g,1)$

** symmetry

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

** expression

$$\frac{15\sqrt{2002}Q_1y\left(3x^2-y^2\right)\left(x^2+y^2-8z^2\right)}{2288}+\frac{15\sqrt{2002}Q_2x\left(x^2-3y^2\right)\left(x^2+y^2-8z^2\right)}{2288}+\frac{5\sqrt{3003}Q_3xyz\left(x^2+y^2-2z^2\right)}{286}+\frac{\sqrt{30030}Q_{3x}x\left(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4\right)}{1456}+\frac{\sqrt{30030}Q_{3y}y\left(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4\right)}{1456}+\frac{3\sqrt{5005}Q_{az}z\left(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4\right)}{4004}+\frac{5\sqrt{3003}Q_{bz}z\left(x-y\right)\left(x+y\right)\left(x^2+y^2-2z^2\right)}{572}$$

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

** symmetry

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

** expression

$$\frac{3\sqrt{715}Q_2z\left(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4\right)}{2288}+\frac{\sqrt{4290}Q_3y\left(29x^4-47x^2y^2-33x^2z^2+8y^4-33y^2z^2+22z^4\right)}{1144}-\frac{7\sqrt{429}Q_{3x}z\left(11x^4+18x^2y^2-28x^2z^2-17y^4+28y^2z^2\right)}{2288}+\frac{7\sqrt{429}Q_{3y}xyz\left(5x^2+2y^2-7z^2\right)}{286}+\frac{21\sqrt{286}Q_{az}x\left(x^2-3y^2\right)\left(x^2+y^2-8z^2\right)}{2288}+\frac{\sqrt{4290}Q_{bz}x\left(5x^4-116x^2y^2+66x^2z^2+47y^4+66y^2z^2-44z^4\right)}{2288}$$

$\vec{\mathbb{Q}}_4^{(3,1)}[q](A_g,3)$

** symmetry

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

** expression

$$\frac{3\sqrt{715}Q_1z\left(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4\right)}{2288}-\frac{\sqrt{4290}Q_3x\left(8x^4-47x^2y^2-33x^2z^2+29y^4-33y^2z^2+22z^4\right)}{1144}-\frac{7\sqrt{429}Q_{3x}xyz\left(2x^2+5y^2-7z^2\right)}{286}-\frac{7\sqrt{429}Q_{3y}z\left(17x^4-18x^2y^2-28x^2z^2-11y^4+28y^2z^2\right)}{2288}+\frac{21\sqrt{286}Q_{az}y\left(3x^2-y^2\right)\left(x^2+y^2-8z^2\right)}{2288}+\frac{\sqrt{4290}Q_{bz}y\left(47x^4-116x^2y^2+66x^2z^2+5y^4+66y^2z^2-44z^4\right)}{2288}$$

$\vec{\mathbb{Q}}_4^{(3,3)}[q](A_g,1)$

** symmetry

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

** expression

$$\frac{3\sqrt{2002}Q_1y\left(3x^2-y^2\right)\left(3x^4+6x^2y^2-60x^2z^2+3y^4-60y^2z^2+80z^4\right)}{4576}+\frac{3\sqrt{2002}Q_2x\left(x^2-3y^2\right)\left(3x^4+6x^2y^2-60x^2z^2+3y^4-60y^2z^2+80z^4\right)}{4576}+\frac{3\sqrt{3003}Q_3xyz\left(15x^4+30x^2y^2-80x^2z^2+15y^4-80y^2z^2+48z^4\right)}{1144}-\frac{\sqrt{30030}Q_{3x}x\left(5x^6+15x^4y^2-120x^4z^2+15x^2y^4-240x^2y^2z^2+240x^2z^4+5y^6-120y^4z^2+240y^2z^4-64z^6\right)}{4576}-\frac{\sqrt{30030}Q_{3y}y\left(5x^6+15x^4y^2-120x^4z^2+15x^2y^4-240x^2y^2z^2+240x^2z^4+5y^6-120y^4z^2+240y^2z^4-64z^6\right)}{4576}-\frac{\sqrt{5005}Q_{az}z\left(35x^6+105x^4y^2-210x^4z^2+105x^2y^4-420x^2y^2z^2+168x^2z^4+35y^6-210y^4z^2+168y^2z^4-16z^6\right)}{2288}+\frac{3\sqrt{3003}Q_{bz}z\left(x-y\right)\left(x+y\right)\left(15x^4+30x^2y^2-80x^2z^2+15y^4-80y^2z^2+48z^4\right)}{2288}$$

$\vec{\mathbb{Q}}_4^{(3,3)}[q](A_g,2)$

** symmetry

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

** expression

$$\frac{3\sqrt{715}Q_{1}xyz\left(x^{2}-3y^{2}\right)\left(3x^{2}-y^{2}\right)}{40} + \frac{\sqrt{715}Q_{2}z\left(232x^{6}-3165x^{4}y^{2}-105x^{4}z^{2}+3270x^{2}y^{4}-210x^{2}y^{2}z^{2}+84x^{2}z^{4}-197y^{6}-105y^{4}z^{2}+84y^{2}z^{4}-8z^{6}\right)}{5720} - \frac{\sqrt{4290}Q_{3}y\left(40x^{6}-45x^{4}y^{2}-465x^{4}z^{2}-78x^{2}y^{4}+1050x^{2}y^{2}z^{2}-60x^{2}z^{4}+7y^{6}-69y^{4}z^{2}-60y^{2}z^{4}+16z^{6}\right)}{2860} - \frac{3\sqrt{429}Q_{3x}z\left(24x^{6}-75x^{4}y^{2}-95x^{4}z^{2}-90x^{2}y^{4}+330x^{2}y^{2}z^{2}+24x^{2}z^{4}+9y^{6}-15y^{4}z^{2}-24y^{2}z^{4}\right)}{1144} - \frac{3\sqrt{429}Q_{3y}xyz\left(51x^{4}-30x^{2}y^{2}-140x^{2}z^{2}-81y^{4}+300y^{2}z^{2}-48z^{4}\right)}{1144} + \frac{3\sqrt{286}Q_{az}x\left(x^{2}-3y^{2}\right)\left(3x^{4}+6x^{2}y^{2}-60x^{2}z^{2}+3y^{4}-60y^{2}z^{2}+80z^{4}\right)}{1144} - \frac{\sqrt{4290}Q_{bz}x\left(19x^{6}-141x^{4}y^{2}-258x^{4}z^{2}-75x^{2}y^{4}+1860x^{2}y^{2}z^{2}+120x^{2}z^{4}+85y^{6}-1050y^{4}z^{2}+120y^{2}z^{4}-32z^{6}\right)}{5720}$$

$\vec{\mathbb{Q}}_{4}^{(3,3)}[q](A_g,3)$

** symmetry

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

** expression

$$-\frac{\sqrt{715}Q_{1}z\left(197x^{6}-3270x^{4}y^{2}+105x^{4}z^{2}+3165x^{2}y^{4}+210x^{2}y^{2}z^{2}-84x^{2}z^{4}-232y^{6}+105y^{4}z^{2}-84y^{2}z^{4}+8z^{6}\right)}{5720} + \frac{3\sqrt{715}Q_{2}xyz\left(x^{2}-3y^{2}\right)\left(3x^{2}-y^{2}\right)}{40} + \frac{\sqrt{4290}Q_{3}x\left(7x^{6}-78x^{4}y^{2}-69x^{4}z^{2}-45x^{2}y^{4}+1050x^{2}y^{2}z^{2}-60x^{2}z^{4}+40y^{6}-465y^{4}z^{2}-60y^{2}z^{4}+16z^{6}\right)}{2860} - \frac{3\sqrt{429}Q_{3x}xyz\left(81x^{4}+30x^{2}y^{2}-300x^{2}z^{2}-51y^{4}+140y^{2}z^{2}+48z^{4}\right)}{1144} + \frac{3\sqrt{429}Q_{3y}z\left(9x^{6}-90x^{4}y^{2}-15x^{4}z^{2}-75x^{2}y^{4}+330x^{2}y^{2}z^{2}-24x^{2}z^{4}+24y^{6}-95y^{4}z^{2}+24y^{2}z^{4}\right)}{1144} + \frac{3\sqrt{286}Q_{az}y\left(3x^{2}-y^{2}\right)\left(3x^{4}+6x^{2}y^{2}-60x^{2}z^{2}+3y^{4}-60y^{2}z^{2}+80z^{4}\right)}{1144} - \frac{\sqrt{4290}Q_{bz}y\left(85x^{6}-75x^{4}y^{2}-1050x^{4}z^{2}-141x^{2}y^{4}+1860x^{2}y^{2}z^{2}+120x^{2}z^{4}+19y^{6}-258y^{4}z^{2}+120y^{2}z^{4}-32z^{6}\right)}{5720}$$

$\vec{\mathbb{Q}}_{4,1}^{(3,-3)}[q](E_g,1)$, $\vec{\mathbb{Q}}_{4,2}^{(3,-3)}[q](E_g,1)$

** symmetry

$$-\frac{\sqrt{10}yz\left(3x^{2}+3y^{2}-4z^{2}\right)}{4}$$

$$\frac{\sqrt{10}xz\left(3x^{2}+3y^{2}-4z^{2}\right)}{4}$$

** expression

$$-\frac{\sqrt{42}Q_{3}x}{28}+\frac{\sqrt{105}Q_{3y}z}{14}+\frac{\sqrt{70}Q_{az}y}{14}+\frac{\sqrt{42}Q_{bz}y}{28}$$

$$\frac{\sqrt{42}Q_{3}y}{28}-\frac{\sqrt{105}Q_{3x}z}{14}-\frac{\sqrt{70}Q_{az}x}{14}+\frac{\sqrt{42}Q_{bz}x}{28}$$

$\vec{\mathbb{Q}}_{4,1}^{(3,-3)}[q](E_g,2)$, $\vec{\mathbb{Q}}_{4,2}^{(3,-3)}[q](E_g,2)$

** symmetry

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

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

** expression

$$-\frac{\sqrt{2}Q_{1}y}{2}+\frac{\sqrt{2}Q_{2}x}{2}$$

$$\frac{\sqrt{2}Q_{1}x}{2}+\frac{\sqrt{2}Q_{2}y}{2}$$

$\vec{\mathbb{Q}}_{4,1}^{(3,-3)}[q](E_g,3)$, $\vec{\mathbb{Q}}_{4,2}^{(3,-3)}[q](E_g,3)$

** symmetry

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

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

** expression

$$-\frac{\sqrt{14}Q_{1}y}{28}-\frac{\sqrt{14}Q_{2}x}{28}+\frac{\sqrt{210}Q_{3x}x}{28}-\frac{\sqrt{210}Q_{3y}y}{28}+\frac{\sqrt{21}Q_{bz}z}{7}$$

$$\frac{\sqrt{14}Q_{1}x}{28}-\frac{\sqrt{14}Q_{2}y}{28}-\frac{\sqrt{21}Q_{3}z}{7}-\frac{\sqrt{210}Q_{3x}y}{28}-\frac{\sqrt{210}Q_{3y}x}{28}$$

$\vec{\mathbb{Q}}_{4,1}^{(3,-1)}[q](E_g,1)$, $\vec{\mathbb{Q}}_{4,2}^{(3,-1)}[q](E_g,1)$

** symmetry

$$-\frac{\sqrt{10}yz\left(3x^{2}+3y^{2}-4z^{2}\right)}{4}$$

$$\frac{\sqrt{10}xz\left(3x^{2}+3y^{2}-4z^{2}\right)}{4}$$

** expression

$$-\frac{15\sqrt{154}Q_{1}z\left(x-y\right)\left(x+y\right)}{308}+\frac{15\sqrt{154}Q_{2}xyz}{154}+\frac{\sqrt{231}Q_{3}x\left(x^{2}-19y^{2}+16z^{2}\right)}{308}+\frac{2\sqrt{2310}Q_{3x}xyz}{77}-\frac{\sqrt{2310}Q_{3y}z\left(7x^{2}-y^{2}-2z^{2}\right)}{308}-\frac{3\sqrt{385}Q_{az}y\left(x^{2}+y^{2}-4z^{2}\right)}{308}-\frac{\sqrt{231}Q_{bz}y\left(11x^{2}-9y^{2}+16z^{2}\right)}{308}$$

$$\frac{15\sqrt{154}Q_{1}xyz}{154}+\frac{15\sqrt{154}Q_{2}z\left(x-y\right)\left(x+y\right)}{308}+\frac{\sqrt{231}Q_{3}y\left(19x^{2}-y^{2}-16z^{2}\right)}{308}-\frac{\sqrt{2310}Q_{3x}z\left(x^{2}-7y^{2}+2z^{2}\right)}{308}-\frac{2\sqrt{2310}Q_{3y}xyz}{77}+\frac{3\sqrt{385}Q_{az}x\left(x^{2}+y^{2}-4z^{2}\right)}{308}+\frac{\sqrt{231}Q_{bz}x\left(9x^{2}-11y^{2}-16z^{2}\right)}{308}$$

$\vec{\mathbb{Q}}_{4,1}^{(3,-1)}[q](E_g,2)$, $\vec{\mathbb{Q}}_{4,2}^{(3,-1)}[q](E_g,2)$

** symmetry

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

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

** expression

$$-\frac{3\sqrt{11}Q_{1}y\left(x^{2}+y^{2}-4z^{2}\right)}{44}+\frac{3\sqrt{11}Q_{2}x\left(x^{2}+y^{2}-4z^{2}\right)}{44}-\frac{5\sqrt{66}Q_{3}xyz}{22}-\frac{\sqrt{165}Q_{3x}x\left(x^{2}-3y^{2}\right)}{44}+\frac{\sqrt{165}Q_{3y}y\left(3x^{2}-y^{2}\right)}{44}+\frac{5\sqrt{66}Q_{bz}z\left(x-y\right)\left(x+y\right)}{44}$$

$$\frac{3\sqrt{11}Q_{1}x\left(x^{2}+y^{2}-4z^{2}\right)}{44}+\frac{3\sqrt{11}Q_{2}y\left(x^{2}+y^{2}-4z^{2}\right)}{44}+\frac{5\sqrt{66}Q_{3}z\left(x-y\right)\left(x+y\right)}{44}-\frac{\sqrt{165}Q_{3x}y\left(3x^{2}-y^{2}\right)}{44}-\frac{\sqrt{165}Q_{3y}x\left(x^{2}-3y^{2}\right)}{44}+\frac{5\sqrt{66}Q_{bz}xyz}{22}$$

$\vec{\mathbb{Q}}_{4,1}^{(3,-1)}[q](E_g,3)$, $\vec{\mathbb{Q}}_{4,2}^{(3,-1)}[q](E_g,3)$

** symmetry

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

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

** expression

$$-\frac{9\sqrt{77}Q_{1}y\left(x^{2}+y^{2}-4z^{2}\right)}{308}-\frac{9\sqrt{77}Q_{2}x\left(x^{2}+y^{2}-4z^{2}\right)}{308}+\frac{\sqrt{1155}Q_{3x}x\left(x^{2}-11y^{2}+8z^{2}\right)}{308}+\frac{\sqrt{1155}Q_{3y}y\left(11x^{2}-y^{2}-8z^{2}\right)}{308}-\frac{3\sqrt{770}Q_{az}z\left(x-y\right)\left(x+y\right)}{308}+\frac{\sqrt{462}Q_{bz}z\left(3x^{2}+3y^{2}-2z^{2}\right)}{308}$$

$$\frac{9\sqrt{77}Q_{1}x\left(x^{2}+y^{2}-4z^{2}\right)}{308}-\frac{9\sqrt{77}Q_{2}y\left(x^{2}+y^{2}-4z^{2}\right)}{308}-\frac{\sqrt{462}Q_{3}z\left(3x^{2}+3y^{2}-2z^{2}\right)}{308}-\frac{\sqrt{1155}Q_{3x}y\left(7x^{2}-5y^{2}+8z^{2}\right)}{308}+\frac{\sqrt{1155}Q_{3y}x\left(5x^{2}-7y^{2}-8z^{2}\right)}{308}+\frac{3\sqrt{770}Q_{az}xyz}{154}$$

$\vec{\mathbb{Q}}_{4,1}^{(3,1)}[q](E_g,1)$, $\vec{\mathbb{Q}}_{4,2}^{(3,1)}[q](E_g,1)$
** symmetry

$$-\frac{\sqrt{10}yz\left(3x^2+3y^2-4z^2\right)}{4}$$

$$\frac{\sqrt{10}xz\left(3x^2+3y^2-4z^2\right)}{4}$$

** expression

$$-\frac{3\sqrt{5005}Q_1z\left(x^4+54x^2y^2-20x^2z^2-19y^4+20y^2z^2\right)}{2288}-\frac{3\sqrt{5005}Q_2xyz\left(2x^2-7y^2+5z^2\right)}{286}+\frac{\sqrt{30030}Q_3x\left(8x^4+9x^2y^2-89x^2z^2+y^4-33y^2z^2+50z^4\right)}{8008}-\frac{4\sqrt{3003}Q_{3x}xyz\left(x^2+y^2-2z^2\right)}{143}+\frac{\sqrt{3003}Q_{3y}z\left(239x^4+30x^2y^2-488x^2z^2-209y^4+408y^2z^2+8z^4\right)}{16016}+\frac{57\sqrt{2002}Q_{az}y\left(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4\right)}{16016}-\frac{\sqrt{30030}Q_{bz}y\left(23x^4+32x^2y^2-234x^2z^2+9y^4-122y^2z^2+100z^4\right)}{16016}$$

$$\frac{3\sqrt{5005}Q_1xyz\left(7x^2-2y^2-5z^2\right)}{286}+\frac{3\sqrt{5005}Q_2z\left(19x^4-54x^2y^2-20x^2z^2-y^4+20y^2z^2\right)}{2288}-\frac{\sqrt{30030}Q_3y\left(x^4+9x^2y^2-33x^2z^2+8y^4-89y^2z^2+50z^4\right)}{8008}+\frac{\sqrt{3003}Q_{3x}z\left(209x^4-30x^2y^2-408x^2z^2-239y^4+488y^2z^2-8z^4\right)}{16016}+\frac{4\sqrt{3003}Q_{3y}xyz\left(x^2+y^2-2z^2\right)}{143}-\frac{57\sqrt{2002}Q_{az}x\left(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4\right)}{16016}-\frac{\sqrt{30030}Q_{bz}x\left(9x^4+32x^2y^2-122x^2z^2+23y^4-234y^2z^2+100z^4\right)}{16016}$$

$\vec{\mathbb{Q}}_{4,1}^{(3,1)}[q](E_g,2)$, $\vec{\mathbb{Q}}_{4,2}^{(3,1)}[q](E_g,2)$
** symmetry

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

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

** expression

$$-\frac{3\sqrt{1430}Q_1y\left(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4\right)}{2288}+\frac{3\sqrt{1430}Q_2x\left(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4\right)}{2288}-\frac{7\sqrt{2145}Q_3xyz\left(x^2+y^2-2z^2\right)}{286}-\frac{7\sqrt{858}Q_{3x}x\left(5x^4-34x^2y^2-16x^2z^2+9y^4+48y^2z^2\right)}{2288}-\frac{7\sqrt{858}Q_{3y}y\left(9x^4-34x^2y^2+48x^2z^2+5y^4-16y^2z^2\right)}{2288}-\frac{63\sqrt{143}Q_{az}z\left(x^2-2xy-y^2\right)\left(x^2+2xy-y^2\right)}{572}+\frac{7\sqrt{2145}Q_{bz}z\left(x-y\right)\left(x+y\right)\left(x^2+y^2-2z^2\right)}{572}$$

$$\frac{3\sqrt{1430}Q_1x\left(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4\right)}{2288}+\frac{3\sqrt{1430}Q_2y\left(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4\right)}{2288}+\frac{7\sqrt{2145}Q_3z\left(x-y\right)\left(x+y\right)\left(x^2+y^2-2z^2\right)}{572}-\frac{7\sqrt{858}Q_{3x}y\left(21x^4-26x^2y^2-48x^2z^2+y^4+16y^2z^2\right)}{2288}+\frac{7\sqrt{858}Q_{3y}x\left(x^4-26x^2y^2+16x^2z^2+21y^4-48y^2z^2\right)}{2288}-\frac{63\sqrt{143}Q_{az}xyz\left(x-y\right)\left(x+y\right)}{143}+\frac{7\sqrt{2145}Q_{bz}xyz\left(x^2+y^2-2z^2\right)}{286}$$

$\vec{\mathbb{Q}}_{4,1}^{(3,1)}[q](E_g,3)$, $\vec{\mathbb{Q}}_{4,2}^{(3,1)}[q](E_g,3)$
** symmetry

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

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

** expression

$$-\frac{9\sqrt{10010}Q_1y\left(10x^4-15x^2y^2-15x^2z^2+3y^4-15y^2z^2+10z^4\right)}{8008}-\frac{9\sqrt{10010}Q_2x\left(3x^4-15x^2y^2-15x^2z^2+10y^4-15y^2z^2+10z^4\right)}{8008}+\frac{3\sqrt{15015}Q_3xyz\left(x-y\right)\left(x+y\right)}{143}-\frac{\sqrt{6006}Q_{3x}x\left(5x^4-53x^2y^2+3x^2z^2-58y^4+507y^2z^2-86z^4\right)}{8008}-\frac{\sqrt{6006}Q_{3y}y\left(58x^4+53x^2y^2-507x^2z^2-5y^4-3y^2z^2+86z^4\right)}{8008}-\frac{3\sqrt{1001}Q_{az}z\left(x-y\right)\left(x+y\right)\left(x^2+y^2-2z^2\right)}{572}-\frac{\sqrt{15015}Q_{bz}z\left(9x^4+186x^2y^2-80x^2z^2+9y^4-80y^2z^2+16z^4\right)}{4004}$$

$$-\frac{9\sqrt{10010}Q_1x\left(x^4-40x^2y^2+30x^2z^2+15y^4+30y^2z^2-20z^4\right)}{16016}+\frac{9\sqrt{10010}Q_2y\left(15x^4-40x^2y^2+30x^2z^2+y^4+30y^2z^2-20z^4\right)}{16016}$$
$$+\frac{\sqrt{15015}Q_3z\left(51x^4-66x^2y^2-80x^2z^2+51y^4-80y^2z^2+16z^4\right)}{4004}+\frac{\sqrt{6006}Q_{3x}y\left(73x^4+20x^2y^2-498x^2z^2-53y^4+510y^2z^2-172z^4\right)}{16016}$$
$$-\frac{\sqrt{6006}Q_{3y}x\left(53x^4-20x^2y^2-510x^2z^2-73y^4+498y^2z^2+172z^4\right)}{16016}+\frac{3\sqrt{1001}Q_{az}xyz\left(x^2+y^2-2z^2\right)}{286}-\frac{3\sqrt{15015}Q_{bz}xyz\left(x-y\right)\left(x+y\right)}{143}$$

$\vec{\mathbb{Q}}_{4,1}^{(3,3)}[q](E_g,1)$, $\vec{\mathbb{Q}}_{4,2}^{(3,3)}[q](E_g,1)$

** symmetry

$$-\frac{\sqrt{10}yz\left(3x^2+3y^2-4z^2\right)}{4}$$

$$\frac{\sqrt{10}xz\left(3x^2+3y^2-4z^2\right)}{4}$$

** expression

$$\frac{3\sqrt{5005}Q_1z\left(9x^6-90x^4y^2-15x^4z^2-75x^2y^4+330x^2y^2z^2-24x^2z^4+24y^6-95y^4z^2+24y^2z^4\right)}{5720}$$
$$-\frac{3\sqrt{5005}Q_2xyz\left(51x^4-30x^2y^2-140x^2z^2-81y^4+300y^2z^2-48z^4\right)}{5720}$$
$$-\frac{\sqrt{30030}Q_3x\left(x^6-6x^4y^2-15x^4z^2-15x^2y^4+150x^2y^2z^2-8y^6+165y^4z^2-240y^2z^4+16z^6\right)}{2860}$$
$$+\frac{3\sqrt{3003}Q_{3x}xyz\left(15x^4+30x^2y^2-80x^2z^2+15y^4-80y^2z^2+48z^4\right)}{1144}$$
$$-\frac{\sqrt{3003}Q_{3y}z\left(5x^6-30x^4y^2-15x^4z^2-75x^2y^4+210x^2y^2z^2-12x^2z^4-40y^6+225y^4z^2-156y^2z^4+8z^6\right)}{1144}$$
$$-\frac{\sqrt{2002}Q_{az}y\left(5x^6+15x^4y^2-120x^4z^2+15x^2y^4-240x^2y^2z^2+240x^2z^4+5y^6-120y^4z^2+240y^2z^4-64z^6\right)}{1144}$$
$$+\frac{\sqrt{30030}Q_{bz}y\left(11x^6+15x^4y^2-210x^4z^2-3x^2y^4-60x^2y^2z^2+240x^2z^4-7y^6+150y^4z^2-240y^2z^4+32z^6\right)}{5720}$$

$$\frac{3\sqrt{5005}Q_1xyz\left(81x^4+30x^2y^2-300x^2z^2-51y^4+140y^2z^2+48z^4\right)}{5720}$$
$$+\frac{3\sqrt{5005}Q_2z\left(24x^6-75x^4y^2-95x^4z^2-90x^2y^4+330x^2y^2z^2+24x^2z^4+9y^6-15y^4z^2-24y^2z^4\right)}{5720}$$
$$-\frac{\sqrt{30030}Q_3y\left(8x^6+15x^4y^2-165x^4z^2+6x^2y^4-150x^2y^2z^2+240x^2z^4-y^6+15y^4z^2-16z^6\right)}{2860}$$
$$-\frac{\sqrt{3003}Q_{3x}z\left(40x^6+75x^4y^2-225x^4z^2+30x^2y^4-210x^2y^2z^2+156x^2z^4-5y^6+15y^4z^2+12y^2z^4-8z^6\right)}{1144}$$
$$-\frac{3\sqrt{3003}Q_{3y}xyz\left(15x^4+30x^2y^2-80x^2z^2+15y^4-80y^2z^2+48z^4\right)}{1144}$$
$$+\frac{\sqrt{2002}Q_{az}x\left(5x^6+15x^4y^2-120x^4z^2+15x^2y^4-240x^2y^2z^2+240x^2z^4+5y^6-120y^4z^2+240y^2z^4-64z^6\right)}{1144}$$
$$-\frac{\sqrt{30030}Q_{bz}x\left(7x^6+3x^4y^2-150x^4z^2-15x^2y^4+60x^2y^2z^2+240x^2z^4-11y^6+210y^4z^2-240y^2z^4-32z^6\right)}{5720}$$

$\vec{\mathbb{Q}}_{4,1}^{(3,3)}[q](E_g,2)$, $\vec{\mathbb{Q}}_{4,2}^{(3,3)}[q](E_g,2)$

** symmetry

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

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

** expression

$$\frac{\sqrt{1430}Q_1y\left(1499x^6-7515x^4y^2+60x^4z^2+4497x^2y^4+120x^2y^2z^2-120x^2z^4-217y^6+60y^4z^2-120y^2z^4+32z^6\right)}{22880}$$
$$+\frac{\sqrt{1430}Q_2x\left(217x^6-4497x^4y^2-60x^4z^2+7515x^2y^4-120x^2y^2z^2+120x^2z^4-1499y^6-60y^4z^2+120y^2z^4-32z^6\right)}{22880}$$
$$+\frac{3\sqrt{2145}Q_3xyz\left(207x^4-730x^2y^2+40x^2z^2+207y^4+40y^2z^2-24z^4\right)}{5720}$$
$$-\frac{3\sqrt{858}Q_{3x}x\left(7x^6-51x^4y^2-96x^4z^2-35x^2y^4+720x^2y^2z^2+40x^2z^4+23y^6-240y^4z^2-120y^2z^4\right)}{4576}$$
$$-\frac{3\sqrt{858}Q_{3y}y\left(23x^6-35x^4y^2-240x^4z^2-51x^2y^4+720x^2y^2z^2-120x^2z^4+7y^6-96y^4z^2+40y^2z^4\right)}{4576}$$
$$-\frac{3\sqrt{143}Q_{az}z\left(x^2-2xy-y^2\right)\left(x^2+2xy-y^2\right)\left(3x^2+3y^2-10z^2\right)}{208}$$
$$+\frac{3\sqrt{2145}Q_{bz}z\left(x-y\right)\left(x+y\right)\left(79x^4-986x^2y^2-40x^2z^2+79y^4-40y^2z^2+24z^4\right)}{11440}$$

$$-\frac{\sqrt{1430}Q_1 x\left(53x^6-1128x^4y^2+15x^4z^2+1875x^2y^4+30x^2y^2z^2-30x^2z^4-376y^6+15y^4z^2-30y^2z^4+8z^6\right)}{5720}$$
$$+\frac{\sqrt{1430}Q_2 y\left(376x^6-1875x^4y^2-15x^4z^2+1128x^2y^4-30x^2y^2z^2+30x^2z^4-53y^6-15y^4z^2+30y^2z^4-8z^6\right)}{5720}$$
$$-\frac{3\sqrt{2145}Q_3 z\left(x-y\right)\left(x+y\right)\left(8x^4-127x^2y^2+5x^2z^2+8y^4+5y^2z^2-3z^4\right)}{1430}$$
$$-\frac{3\sqrt{858}Q_{3x} y\left(8x^6-5x^4y^2-105x^4z^2-12x^2y^4+150x^2y^2z^2+30x^2z^4+y^6-9y^4z^2-10y^2z^4\right)}{1144}$$
$$+\frac{3\sqrt{858}Q_{3y} x\left(x^6-12x^4y^2-9x^4z^2-5x^2y^4+150x^2y^2z^2-10x^2z^4+8y^6-105y^4z^2+30y^2z^4\right)}{1144}$$
$$-\frac{3\sqrt{143}Q_{az} xyz\left(x-y\right)\left(x+y\right)\left(3x^2+3y^2-10z^2\right)}{52}+\frac{3\sqrt{2145}Q_{bz} xyz\left(111x^4-350x^2y^2-20x^2z^2+111y^4-20y^2z^2+12z^4\right)}{2860}$$

$\vec{\mathbb{Q}}_{4,1}^{(3,3)}[q](E_g,3)$, $\vec{\mathbb{Q}}_{4,2}^{(3,3)}[q](E_g,3)$
** symmetry

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

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

** expression

$$-\frac{\sqrt{10010}Q_1 y\left(85x^6-75x^4y^2-1050x^4z^2-141x^2y^4+1860x^2y^2z^2+120x^2z^4+19y^6-258y^4z^2+120y^2z^4-32z^6\right)}{11440}$$
$$-\frac{\sqrt{10010}Q_2 x\left(19x^6-141x^4y^2-258x^4z^2-75x^2y^4+1860x^2y^2z^2+120x^2z^4+85y^6-1050y^4z^2+120y^2z^4-32z^6\right)}{11440}$$
$$-\frac{3\sqrt{15015}Q_3 xyz\left(x-y\right)\left(x+y\right)\left(3x^2+3y^2-10z^2\right)}{260}$$
$$+\frac{\sqrt{6006}Q_{3x} x\left(7x^6+3x^4y^2-150x^4z^2-15x^2y^4+60x^2y^2z^2+240x^2z^4-11y^6+210y^4z^2-240y^2z^4-32z^6\right)}{2288}$$
$$+\frac{\sqrt{6006}Q_{3y} y\left(11x^6+15x^4y^2-210x^4z^2-3x^2y^4-60x^2y^2z^2+240x^2z^4-7y^6+150y^4z^2-240y^2z^4+32z^6\right)}{2288}$$
$$+\frac{3\sqrt{1001}Q_{az} z\left(x-y\right)\left(x+y\right)\left(15x^4+30x^2y^2-80x^2z^2+15y^4-80y^2z^2+48z^4\right)}{1144}$$
$$-\frac{\sqrt{15015}Q_{bz} z\left(67x^6-195x^4y^2-270x^4z^2-195x^2y^4+780x^2y^2z^2+84x^2z^4+67y^6-270y^4z^2+84y^2z^4-8z^6\right)}{5720}$$

$$-\frac{\sqrt{10010}Q_1 x\left(7x^6-78x^4y^2-69x^4z^2-45x^2y^4+1050x^2y^2z^2-60x^2z^4+40y^6-465y^4z^2-60y^2z^4+16z^6\right)}{5720}$$
$$+\frac{\sqrt{10010}Q_2 y\left(40x^6-45x^4y^2-465x^4z^2-78x^2y^4+1050x^2y^2z^2-60x^2z^4+7y^6-69y^4z^2-60y^2z^4+16z^6\right)}{5720}$$
$$-\frac{\sqrt{15015}Q_3 z\left(8x^6-75x^4y^2-15x^4z^2-75x^2y^4+300x^2y^2z^2-21x^2z^4+8y^6-15y^4z^2-21y^2z^4+2z^6\right)}{1430}$$
$$-\frac{\sqrt{6006}Q_{3x} y\left(8x^6+15x^4y^2-165x^4z^2+6x^2y^4-150x^2y^2z^2+240x^2z^4-y^6+15y^4z^2-16z^6\right)}{1144}$$
$$+\frac{\sqrt{6006}Q_{3y} x\left(x^6-6x^4y^2-15x^4z^2-15x^2y^4+150x^2y^2z^2-8y^6+165y^4z^2-240y^2z^4+16z^6\right)}{1144}$$
$$-\frac{3\sqrt{1001}Q_{az} xyz\left(15x^4+30x^2y^2-80x^2z^2+15y^4-80y^2z^2+48z^4\right)}{572}+\frac{3\sqrt{15015}Q_{bz} xyz\left(x-y\right)\left(x+y\right)\left(3x^2+3y^2-10z^2\right)}{260}$$