PG No. 29 $T_{\rm h}$ $m\bar{3}$ [cubic] (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

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

** symmetry

$$x$$

$$y$$

$$z$$

** expression

$$\frac{3\sqrt{14}Q_{1}xy}{14}+\frac{3\sqrt{14}Q_{2}\left(x-y\right)\left(x+y\right)}{28}+\frac{\sqrt{21}Q_{3}yz}{7}-\frac{\sqrt{210}Q_{3x}\left(3x^{2}+y^{2}-4z^{2}\right)}{140}-\frac{\sqrt{210}Q_{3y}xy}{70}-\frac{3\sqrt{35}Q_{az}xz}{35}+\frac{\sqrt{21}Q_{bz}xz}{7}$$

$$\frac{3\sqrt{14}Q_{1}\left(x-y\right)\left(x+y\right)}{28}-\frac{3\sqrt{14}Q_{2}xy}{14}+\frac{\sqrt{21}Q_{3}xz}{7}-\frac{\sqrt{210}Q_{3x}xy}{70}-\frac{\sqrt{210}Q_{3y}\left(x^{2}+3y^{2}-4z^{2}\right)}{140}-\frac{3\sqrt{35}Q_{az}yz}{35}-\frac{\sqrt{21}Q_{bz}yz}{7}$$

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

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

** symmetry

$$x$$

$$y$$

$$z$$

** expression

$$\frac{\sqrt{210}Q_{1}xy\left(15x^{2}-13y^{2}-6z^{2}\right)}{168}+\frac{\sqrt{210}Q_{2}\left(4x^{4}-21x^{2}y^{2}-3x^{2}z^{2}+3y^{4}+3y^{2}z^{2}\right)}{168}+\frac{\sqrt{35}Q_{3}yz\left(6x^{2}-y^{2}-z^{2}\right)}{14}-\frac{\sqrt{14}Q_{3x}\left(4x^{4}+3x^{2}y^{2}-27x^{2}z^{2}-y^{4}+3y^{2}z^{2}+4z^{4}\right)}{56}-\frac{5\sqrt{14}Q_{3y}xy\left(x^{2}+y^{2}-6z^{2}\right)}{56}-\frac{5\sqrt{21}Q_{az}xz\left(3x^{2}+3y^{2}-4z^{2}\right)}{84}+\frac{\sqrt{35}Q_{bz}xz\left(5x^{2}-9y^{2}-2z^{2}\right)}{28}$$

$$-\frac{\sqrt{210}Q_{1}\left(3x^{4}-21x^{2}y^{2}+3x^{2}z^{2}+4y^{4}-3y^{2}z^{2}\right)}{168}+\frac{\sqrt{210}Q_{2}xy\left(13x^{2}-15y^{2}+6z^{2}\right)}{168}-\frac{\sqrt{35}Q_{3}xz\left(x^{2}-6y^{2}+z^{2}\right)}{14}-\frac{5\sqrt{14}Q_{3x}xy\left(x^{2}+y^{2}-6z^{2}\right)}{56}+\frac{\sqrt{14}Q_{3y}\left(x^{4}-3x^{2}y^{2}-3x^{2}z^{2}-4y^{4}+27y^{2}z^{2}-4z^{4}\right)}{56}-\frac{5\sqrt{21}Q_{az}yz\left(3x^{2}+3y^{2}-4z^{2}\right)}{84}+\frac{\sqrt{35}Q_{bz}yz\left(9x^{2}-5y^{2}+2z^{2}\right)}{28}$$

$$\frac{\sqrt{210}Q_{1}yz\left(3x^{2}-y^{2}\right)}{24}+\frac{\sqrt{210}Q_{2}xz\left(x^{2}-3y^{2}\right)}{24}-\frac{\sqrt{35}Q_{3}xy\left(x^{2}+y^{2}-6z^{2}\right)}{14}-\frac{5\sqrt{14}Q_{3x}xz\left(3x^{2}+3y^{2}-4z^{2}\right)}{56}-\frac{5\sqrt{14}Q_{3y}yz\left(3x^{2}+3y^{2}-4z^{2}\right)}{56}+\frac{\sqrt{21}Q_{az}\left(3x^{4}+6x^{2}y^{2}-24x^{2}z^{2}+3y^{4}-24y^{2}z^{2}+8z^{4}\right)}{84}-\frac{\sqrt{35}Q_{bz}\left(x-y\right)\left(x+y\right)\left(x^{2}+y^{2}-6z^{2}\right)}{28}$$

* Harmonics for rank 2

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

** symmetry

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

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

** expression

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

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

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

** symmetry

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

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

** expression

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

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

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

** symmetry

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

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

** expression

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

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

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

** symmetry

$$\sqrt{3}yz$$

$$\sqrt{3}xz$$

$$\sqrt{3}xy$$

** expression

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

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

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

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

$$\sqrt{3}yz$$

$$\sqrt{3}xz$$

$$\sqrt{3}xy$$

** expression

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

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

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

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

$$\sqrt{3}yz$$

$$\sqrt{3}xz$$

$$\sqrt{3}xy$$

** expression

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

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

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

* Harmonics for rank 3
$\vec{\mathbb{Q}}_{3}^{(3,-3)}[q](A_u)$
** symmetry

$$\sqrt{15}xyz$$

** expression

$$Q_{3}$$

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

$$\sqrt{15}xyz$$

** expression

$$\frac{\sqrt{10}Q_{1}xz}{4} - \frac{\sqrt{10}Q_{2}yz}{4} + \frac{\sqrt{6}Q_{3x}yz}{4} + \frac{\sqrt{6}Q_{3y}xz}{4} - Q_{az}xy$$

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

$$\sqrt{15}xyz$$

** expression

$$\frac{5\sqrt{33}Q_{1}xz\left(3x^{2}+3y^{2}-4z^{2}\right)}{132} - \frac{5\sqrt{33}Q_{2}yz\left(3x^{2}+3y^{2}-4z^{2}\right)}{132} - \frac{7\sqrt{22}Q_{3}\left(x^{4}-3x^{2}y^{2}-3x^{2}z^{2}+y^{4}-3y^{2}z^{2}+z^{4}\right)}{66} + \frac{\sqrt{55}Q_{3x}yz\left(9x^{2}-19y^{2}+16z^{2}\right)}{132} - \frac{\sqrt{55}Q_{3y}xz\left(19x^{2}-9y^{2}-16z^{2}\right)}{132} + \frac{\sqrt{330}Q_{az}xy\left(x^{2}+y^{2}-6z^{2}\right)}{132} + \frac{35\sqrt{22}Q_{bz}xy\left(x-y\right)\left(x+y\right)}{132}$$

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

$$\sqrt{15}xyz$$

** expression

$$-\frac{7\sqrt{286}Q_{1}xz\left(7x^{4}-85x^{2}y^{2}+5x^{2}z^{2}+40y^{4}+5y^{2}z^{2}-2z^{4}\right)}{1144} + \frac{7\sqrt{286}Q_{2}yz\left(40x^{4}-85x^{2}y^{2}+5x^{2}z^{2}+7y^{4}+5y^{2}z^{2}-2z^{4}\right)}{1144} + \frac{\sqrt{429}Q_{3}\left(2x^{6}-15x^{4}y^{2}-15x^{4}z^{2}-15x^{2}y^{4}+180x^{2}y^{2}z^{2}-15x^{2}z^{4}+2y^{6}-15y^{4}z^{2}-15y^{2}z^{4}+2z^{6}\right)}{286} - \frac{7\sqrt{4290}Q_{3x}yz\left(8x^{4}+7x^{2}y^{2}-23x^{2}z^{2}-y^{4}+y^{2}z^{2}+2z^{4}\right)}{1144} + \frac{7\sqrt{4290}Q_{3y}xz\left(x^{4}-7x^{2}y^{2}-x^{2}z^{2}-8y^{4}+23y^{2}z^{2}-2z^{4}\right)}{1144} + \frac{7\sqrt{715}Q_{az}xy\left(x^{4}+2x^{2}y^{2}-16x^{2}z^{2}+y^{4}-16y^{2}z^{2}+16z^{4}\right)}{572} - \frac{21\sqrt{429}Q_{bz}xy\left(x-y\right)\left(x+y\right)\left(x^{2}+y^{2}-10z^{2}\right)}{572}$$

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

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

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

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

** expression

$$\frac{\sqrt{10}Q_{2}}{4} - \frac{\sqrt{6}Q_{3x}}{4}$$

$$-\frac{\sqrt{10}Q_{1}}{4} - \frac{\sqrt{6}Q_{3y}}{4}$$

$$Q_{az}$$

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

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

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

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

** expression

$$-\frac{\sqrt{6}Q_{2}}{4} - \frac{\sqrt{10}Q_{3x}}{4}$$

$$-\frac{\sqrt{6}Q_{1}}{4} + \frac{\sqrt{10}Q_{3y}}{4}$$

Q_{bz}

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

** symmetry

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

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

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

** expression

$$\frac{\sqrt{6}Q_1xy}{8}+\frac{\sqrt{6}Q_2\left(4x^2+y^2-5z^2\right)}{24}-Q_3yz-\frac{\sqrt{10}Q_{3x}\left(4x^2-7y^2+3z^2\right)}{40}-\frac{\sqrt{10}Q_{3y}xy}{40}-\frac{\sqrt{15}Q_{az}xz}{20}+\frac{Q_{bz}xz}{4}$$

$$-\frac{\sqrt{6}Q_1\left(x^2+4y^2-5z^2\right)}{24}-\frac{\sqrt{6}Q_2xy}{8}-Q_3xz-\frac{\sqrt{10}Q_{3x}xy}{40}+\frac{\sqrt{10}Q_{3y}\left(7x^2-4y^2-3z^2\right)}{40}-\frac{\sqrt{15}Q_{az}yz}{20}-\frac{Q_{bz}yz}{4}$$

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

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

** symmetry

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

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

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

** expression

$$\frac{\sqrt{10}Q_1xy}{8}-\frac{\sqrt{10}Q_2\left(y-z\right)\left(y+z\right)}{8}+\frac{\sqrt{6}Q_{3x}\left(y-z\right)\left(y+z\right)}{8}-\frac{3\sqrt{6}Q_{3y}xy}{8}-\frac{Q_{az}xz}{4}-\frac{\sqrt{15}Q_{bz}xz}{4}$$

$$-\frac{\sqrt{10}Q_1\left(x-z\right)\left(x+z\right)}{8}+\frac{\sqrt{10}Q_2xy}{8}+\frac{3\sqrt{6}Q_{3x}xy}{8}-\frac{\sqrt{6}Q_{3y}\left(x-z\right)\left(x+z\right)}{8}+\frac{Q_{az}yz}{4}-\frac{\sqrt{15}Q_{bz}yz}{4}$$

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

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

** symmetry

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

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

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

** expression

$$\frac{\sqrt{55}Q_1xy\left(5x^2-2y^2-9z^2\right)}{44}+\frac{\sqrt{55}Q_2\left(4x^4-9x^2y^2-15x^2z^2+y^4+3y^2z^2+2z^4\right)}{88}-\frac{\sqrt{330}Q_3yz\left(6x^2-y^2-z^2\right)}{132}-\frac{\sqrt{33}Q_{3x}\left(12x^4-51x^2y^2-21x^2z^2+7y^4+9y^2z^2+2z^4\right)}{264}-\frac{5\sqrt{33}Q_{3y}xy\left(x^2-6y^2+15z^2\right)}{132}-\frac{5\sqrt{22}Q_{az}xz\left(x^2-6y^2+z^2\right)}{44}+\frac{\sqrt{330}Q_{bz}xz\left(5x^2+12y^2-9z^2\right)}{132}$$

$$-\frac{\sqrt{55}Q_1\left(x^4-9x^2y^2+3x^2z^2+4y^4-15y^2z^2+2z^4\right)}{88}+\frac{\sqrt{55}Q_2xy\left(2x^2-5y^2+9z^2\right)}{44}+\frac{\sqrt{330}Q_3xz\left(x^2-6y^2+z^2\right)}{132}+\frac{5\sqrt{33}Q_{3x}xy\left(6x^2-y^2-15z^2\right)}{132}-\frac{\sqrt{33}Q_{3y}\left(7x^4-51x^2y^2+9x^2z^2+12y^4-21y^2z^2+2z^4\right)}{264}+\frac{5\sqrt{22}Q_{az}yz\left(6x^2-y^2-z^2\right)}{44}-\frac{\sqrt{330}Q_{bz}yz\left(12x^2+5y^2-9z^2\right)}{132}$$

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

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

** symmetry

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

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

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

** expression

$$\frac{5\sqrt{33}Q_1xy\left(5x^2-2y^2-9z^2\right)}{132}+\frac{\sqrt{33}Q_2\left(14x^4-57x^2y^2-27x^2z^2-y^4+63y^2z^2-6z^4\right)}{264}+\frac{35\sqrt{22}Q_3yz\left(y-z\right)\left(y+z\right)}{132}+\frac{\sqrt{55}Q_{3x}\left(14x^4-33x^2y^2-51x^2z^2-5y^4+63y^2z^2-2z^4\right)}{264}+\frac{\sqrt{55}Q_{3y}xy\left(11x^2-10y^2-3z^2\right)}{132}+\frac{\sqrt{330}Q_{az}xz\left(9x^2-12y^2-5z^2\right)}{132}-\frac{5\sqrt{22}Q_{bz}xz\left(x^2-6y^2+z^2\right)}{132}$$

$$-\frac{\sqrt{33}Q_1\left(x^4+57x^2y^2-63x^2z^2-14y^4+27y^2z^2+6z^4\right)}{264}-\frac{5\sqrt{33}Q_2xy\left(2x^2-5y^2+9z^2\right)}{132}-\frac{35\sqrt{22}Q_3xz\left(x-z\right)\left(x+z\right)}{132}+\frac{\sqrt{55}Q_{3x}xy\left(10x^2-11y^2+3z^2\right)}{132}+\frac{\sqrt{55}Q_{3y}\left(5x^4+33x^2y^2-63x^2z^2-14y^4+51y^2z^2+2z^4\right)}{264}+\frac{\sqrt{330}Q_{az}yz\left(12x^2-9y^2+5z^2\right)}{132}+\frac{5\sqrt{22}Q_{bz}yz\left(6x^2-y^2-z^2\right)}{132}$$

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

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

** symmetry

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

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

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

** expression

$$\frac{7\sqrt{4290}Q_1xy\left(10x^4-27x^2y^2-19x^2z^2+7y^4+11y^2z^2+4z^4\right)}{2288}+\frac{\sqrt{4290}Q_2\left(40x^6-468x^4y^2-132x^4z^2+393x^2y^4+450x^2y^2z^2+57x^2z^4-23y^6-48y^4z^2-27y^2z^4-2z^6\right)}{6864}+\frac{7\sqrt{715}Q_3yz\left(16x^4-16x^2y^2-16x^2z^2+y^4+2y^2z^2+z^4\right)}{572}-\frac{5\sqrt{286}Q_{3x}\left(8x^6-4x^4y^2-116x^4z^2-11x^2y^4+90x^2y^2z^2+101x^2z^4+y^6-4y^4z^2-11y^2z^4-6z^6\right)}{2288}-\frac{35\sqrt{286}Q_{3y}xy\left(2x^4+x^2y^2-23x^2z^2-y^4+7y^2z^2+8z^4\right)}{2288}-\frac{35\sqrt{429}Q_{az}xz\left(2x^4+x^2y^2-7x^2z^2-y^4+y^2z^2+2z^4\right)}{1144}+\frac{7\sqrt{715}Q_{bz}xz\left(10x^4-43x^2y^2-19x^2z^2+13y^4+17y^2z^2+4z^4\right)}{1144}$$

$$\frac{\sqrt{4290}Q_1\left(23x^6-393x^4y^2+48x^4z^2+468x^2y^4-450x^2y^2z^2+27x^2z^4-40y^6+132y^4z^2-57y^2z^4+2z^6\right)}{6864}-\frac{7\sqrt{4290}Q_2xy\left(7x^4-27x^2y^2+11x^2z^2+10y^4-19y^2z^2+4z^4\right)}{2288}+\frac{7\sqrt{715}Q_3xz\left(x^4-16x^2y^2+2x^2z^2+16y^4-16y^2z^2+z^4\right)}{572}+\frac{35\sqrt{286}Q_{3x}xy\left(x^4-x^2y^2-7x^2z^2-2y^4+23y^2z^2-8z^4\right)}{2288}-\frac{5\sqrt{286}Q_{3y}\left(x^6-11x^4y^2-4x^4z^2-4x^2y^4+90x^2y^2z^2-11x^2z^4+8y^6-116y^4z^2+101y^2z^4-6z^6\right)}{2288}+\frac{35\sqrt{429}Q_{az}yz\left(x^4-x^2y^2-x^2z^2-2y^4+7y^2z^2-2z^4\right)}{1144}-\frac{7\sqrt{715}Q_{bz}yz\left(13x^4-43x^2y^2+17x^2z^2+10y^4-19y^2z^2+4z^4\right)}{1144}$$

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

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

** symmetry

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

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

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

** expression

$$-\frac{7\sqrt{286}Q_1xy\left(16x^4-85x^2y^2+95x^2z^2+31y^4-55y^2z^2-20z^4\right)}{2288}$$
$$-\frac{\sqrt{286}Q_2\left(12x^6-370x^4y^2+190x^4z^2+505x^2y^4-810x^2y^2z^2-55x^2z^4-37y^6+50y^4z^2+85y^2z^4-2z^6\right)}{2288}$$
$$+\frac{21\sqrt{429}Q_3yz\left(y-z\right)\left(y+z\right)\left(10x^2-y^2-z^2\right)}{572}$$
$$-\frac{\sqrt{4290}Q_{3x}\left(4x^6+26x^4y^2-86x^4z^2+19x^2y^4-270x^2y^2z^2+131x^2z^4-3y^6+26y^4z^2+19y^2z^4-10z^6\right)}{2288}$$
$$-\frac{21\sqrt{4290}Q_{3y}xy\left(x^2y^2-3x^2z^2+y^4-13y^2z^2+8z^4\right)}{2288}-\frac{7\sqrt{715}Q_{az}xz\left(4x^4+17x^2y^2-19x^2z^2+13y^4-43y^2z^2+10z^4\right)}{1144}$$
$$+\frac{7\sqrt{429}Q_{bz}xz\left(4x^4+35x^2y^2-25x^2z^2-35y^4+35y^2z^2+4z^4\right)}{1144}$$

$$\frac{\sqrt{286}Q_1\left(37x^6-505x^4y^2-50x^4z^2+370x^2y^4+810x^2y^2z^2-85x^2z^4-12y^6-190y^4z^2+55y^2z^4+2z^6\right)}{2288}$$
$$-\frac{7\sqrt{286}Q_2xy\left(31x^4-85x^2y^2-55x^2z^2+16y^4+95y^2z^2-20z^4\right)}{2288}$$
$$+\frac{21\sqrt{429}Q_3xz\left(x-z\right)\left(x+z\right)\left(x^2-10y^2+z^2\right)}{572}+\frac{21\sqrt{4290}Q_{3x}xy\left(x^4+x^2y^2-13x^2z^2-3y^2z^2+8z^4\right)}{2288}$$
$$-\frac{\sqrt{4290}Q_{3y}\left(3x^6-19x^4y^2-26x^4z^2-26x^2y^4+270x^2y^2z^2-19x^2z^4-4y^6+86y^4z^2-131y^2z^4+10z^6\right)}{2288}$$
$$+\frac{7\sqrt{715}Q_{az}yz\left(13x^4+17x^2y^2-43x^2z^2+4y^4-19y^2z^2+10z^4\right)}{1144}-\frac{7\sqrt{429}Q_{bz}yz\left(35x^4-35x^2y^2-35x^2z^2-4y^4+25y^2z^2-4z^4\right)}{1144}$$

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

* Harmonics for rank 4

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

** symmetry

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

** expression

$$-\frac{\sqrt{30}Q_1y}{12}+\frac{\sqrt{30}Q_2x}{12}-\frac{\sqrt{2}Q_{3x}x}{4}-\frac{\sqrt{2}Q_{3y}y}{4}+\frac{\sqrt{3}Q_{az}z}{3}$$

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

** symmetry

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

** expression

$$\frac{\sqrt{165}Q_1y\left(x^2-y^2+2z^2\right)}{44}+\frac{\sqrt{165}Q_2x\left(x^2-y^2-2z^2\right)}{44}-\frac{3\sqrt{110}Q_3xyz}{11}-\frac{\sqrt{11}Q_{3x}x\left(3x^2-7y^2-2z^2\right)}{44}+\frac{\sqrt{11}Q_{3y}y\left(7x^2-3y^2+2z^2\right)}{44}-\frac{\sqrt{66}Q_{az}z\left(3x^2+3y^2-2z^2\right)}{44}-\frac{\sqrt{110}Q_{bz}z\left(x-y\right)\left(x+y\right)}{44}$$

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

** symmetry

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

** expression

$$\frac{5\sqrt{858}Q_1y\left(5x^4+3x^2y^2-39x^2z^2-2y^4+17y^2z^2-2z^4\right)}{1144}+\frac{5\sqrt{858}Q_2x\left(2x^4-3x^2y^2-17x^2z^2-5y^4+39y^2z^2+2z^4\right)}{1144}-\frac{\sqrt{1430}Q_{3x}x\left(6x^4-65x^2y^2+5x^2z^2+13y^4+117y^2z^2-22z^4\right)}{1144}-\frac{\sqrt{1430}Q_{3y}y\left(13x^4-65x^2y^2+117x^2z^2+6y^4+5y^2z^2-22z^4\right)}{1144}-\frac{\sqrt{2145}Q_{az}z\left(3x^4-78x^2y^2+20x^2z^2+3y^4+20y^2z^2-4z^4\right)}{572}+\frac{35\sqrt{143}Q_{bz}z\left(x-y\right)\left(x+y\right)\left(x^2+y^2-2z^2\right)}{572}$$

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

** symmetry

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

** expression

$$\frac{\sqrt{858}Q_1y\left(211x^6-900x^4y^2-465x^4z^2+570x^2y^4-300x^2y^2z^2+615x^2z^4-35y^6+165y^4z^2-225y^2z^4+4z^6\right)}{3432}+\frac{\sqrt{858}Q_2x\left(35x^6-570x^4y^2-165x^4z^2+900x^2y^4+300x^2y^2z^2+225x^2z^4-211y^6+465y^4z^2-615y^2z^4-4z^6\right)}{3432}+\frac{3\sqrt{143}Q_3xyz\left(3x^4-5x^2y^2-5x^2z^2+3y^4-5y^2z^2+3z^4\right)}{22}-\frac{\sqrt{1430}Q_{3x}x\left(7x^6-6x^4y^2-141x^4z^2+60x^2y^2z^2+225x^2z^4+13y^6-195y^4z^2+165y^2z^4-56z^6\right)}{1144}-\frac{\sqrt{1430}Q_{3y}y\left(13x^6-195x^4z^2-6x^2y^4+60x^2y^2z^2+165x^2z^4+7y^6-141y^4z^2+225y^2z^4-56z^6\right)}{1144}-\frac{\sqrt{2145}Q_{az}z\left(43x^6+30x^4y^2-225x^4z^2+30x^2y^4-120x^2y^2z^2+147x^2z^4+43y^6-225y^4z^2+147y^2z^4-14z^6\right)}{1716}+\frac{3\sqrt{143}Q_{bz}z\left(x-y\right)\left(x+y\right)\left(23x^4-97x^2y^2-75x^2z^2+23y^4-75y^2z^2+45z^4\right)}{572}$$

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

** symmetry

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

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

** expression

$$\frac{\sqrt{42}Q_1y}{12}-\frac{\sqrt{42}Q_2x}{12}-\frac{\sqrt{70}Q_{3x}x}{28}-\frac{\sqrt{70}Q_{3y}y}{28}+\frac{\sqrt{105}Q_{az}z}{21}$$

$$\frac{\sqrt{14}Q_1y}{28}+\frac{\sqrt{14}Q_2x}{28}-\frac{\sqrt{210}Q_{3x}x}{28}+\frac{\sqrt{210}Q_{3y}y}{28}-\frac{\sqrt{21}Q_{bz}z}{7}$$

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

** symmetry

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

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

** expression

$$\frac{\sqrt{231} Q_{1} y \left(11 x^{2} + y^{2} - 14 z^{2}\right)}{308} - \frac{\sqrt{231} Q_{2} x \left(x^{2} + 11 y^{2} - 14 z^{2}\right)}{308} + \frac{\sqrt{385} Q_{3x} x \left(3 x^{2} - 11 y^{2} + 2 z^{2}\right)}{308} - \frac{\sqrt{385} Q_{3y} y \left(11 x^{2} - 3 y^{2} - 2 z^{2}\right)}{308} - \frac{\sqrt{2310} Q_{az} z \left(3 x^{2} + 3 y^{2} - 2 z^{2}\right)}{308} - \frac{5 \sqrt{154} Q_{bz} z \left(x - y\right) \left(x + y\right)}{44}$$

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

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

** symmetry

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

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

** expression

$$\frac{\sqrt{30030} Q_{1} y \left(4 x^{4} + 3 x^{2} y^{2} - 33 x^{2} z^{2} - y^{4} + 7 y^{2} z^{2} + 2 z^{4}\right)}{1144} + \frac{\sqrt{30030} Q_{2} x \left(x^{4} - 3 x^{2} y^{2} - 7 x^{2} z^{2} - 4 y^{4} + 33 y^{2} z^{2} - 2 z^{4}\right)}{1144} + \frac{3 \sqrt{5005} Q_{3} x y z \left(x^{2} + y^{2} - 2 z^{2}\right)}{143} + \frac{\sqrt{2002} Q_{3x} x \left(75 x^{4} - 389 x^{2} y^{2} - 361 x^{2} z^{2} + 124 y^{4} + 423 y^{2} z^{2} + 110 z^{4}\right)}{8008} + \frac{\sqrt{2002} Q_{3y} y \left(124 x^{4} - 389 x^{2} y^{2} + 423 x^{2} z^{2} + 75 y^{4} - 361 y^{2} z^{2} + 110 z^{4}\right)}{8008} + \frac{\sqrt{3003} Q_{az} z \left(111 x^{4} - 366 x^{2} y^{2} - 100 x^{2} z^{2} + 111 y^{4} - 100 y^{2} z^{2} + 20 z^{4}\right)}{4004} - \frac{\sqrt{5005} Q_{bz} z \left(x - y\right) \left(x + y\right) \left(x^{2} + y^{2} - 2 z^{2}\right)}{572}$$

$$\frac{9 \sqrt{10010} Q_{1} y \left(10 x^{4} - 15 x^{2} y^{2} - 15 x^{2} z^{2} + 3 y^{4} - 15 y^{2} z^{2} + 10 z^{4}\right)}{8008} + \frac{9 \sqrt{10010} Q_{2} x \left(3 x^{4} - 15 x^{2} y^{2} - 15 x^{2} z^{2} + 10 y^{4} - 15 y^{2} z^{2} + 10 z^{4}\right)}{8008} - \frac{3 \sqrt{15015} Q_{3} x y z \left(x - y\right) \left(x + y\right)}{143} + \frac{\sqrt{6006} Q_{3x} x \left(5 x^{4} - 53 x^{2} y^{2} + 3 x^{2} z^{2} - 58 y^{4} + 507 y^{2} z^{2} - 86 z^{4}\right)}{8008} + \frac{\sqrt{6006} Q_{3y} y \left(58 x^{4} + 53 x^{2} y^{2} - 507 x^{2} z^{2} - 5 y^{4} - 3 y^{2} z^{2} + 86 z^{4}\right)}{8008} + \frac{3 \sqrt{1001} Q_{az} z \left(x - y\right) \left(x + y\right) \left(x^{2} + y^{2} - 2 z^{2}\right)}{572} + \frac{\sqrt{15015} Q_{bz} z \left(9 x^{4} + 186 x^{2} y^{2} - 80 x^{2} z^{2} + 9 y^{4} - 80 y^{2} z^{2} + 16 z^{4}\right)}{4004}$$

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

** symmetry

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

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

** expression

$$- \frac{\sqrt{30030} Q_{1} y \left(341 x^{6} - 1935 x^{4} y^{2} + 690 x^{4} z^{2} + 1113 x^{2} y^{4} + 480 x^{2} y^{2} z^{2} - 930 x^{2} z^{4} - 43 y^{6} - 210 y^{4} z^{2} + 270 y^{2} z^{4} + 8 z^{6}\right)}{34320} - \frac{\sqrt{30030} Q_{2} x \left(43 x^{6} - 1113 x^{4} y^{2} + 210 x^{4} z^{2} + 1935 x^{2} y^{4} - 480 x^{2} y^{2} z^{2} - 270 x^{2} z^{4} - 341 y^{6} - 690 y^{4} z^{2} + 930 y^{2} z^{4} - 8 z^{6}\right)}{34320} - \frac{3 \sqrt{5005} Q_{3} x y z \left(3 x^{4} - 20 x^{2} y^{2} + 10 x^{2} z^{2} + 3 y^{4} + 10 y^{2} z^{2} - 6 z^{4}\right)}{260} - \frac{\sqrt{2002} Q_{3x} x \left(x^{6} + 57 x^{4} y^{2} - 78 x^{4} z^{2} + 45 x^{2} y^{4} - 840 x^{2} y^{2} z^{2} + 270 x^{2} z^{4} - 11 y^{6} + 30 y^{4} z^{2} + 390 y^{2} z^{4} - 80 z^{6}\right)}{2288} + \frac{\sqrt{2002} Q_{3y} y \left(11 x^{6} - 45 x^{4} y^{2} - 30 x^{4} z^{2} - 57 x^{2} y^{4} + 840 x^{2} y^{2} z^{2} - 390 x^{2} z^{4} - y^{6} + 78 y^{4} z^{2} - 270 y^{2} z^{4} + 80 z^{6}\right)}{2288} - \frac{\sqrt{3003} Q_{az} z \left(19 x^{6} + 255 x^{4} y^{2} - 180 x^{4} z^{2} + 255 x^{2} y^{4} - 1020 x^{2} y^{2} z^{2} + 210 x^{2} z^{4} + 19 y^{6} - 180 y^{4} z^{2} + 210 y^{2} z^{4} - 20 z^{6}\right)}{3432} - \frac{3 \sqrt{5005} Q_{bz} z \left(x - y\right) \left(x + y\right) \left(x^{4} - 284 x^{2} y^{2} + 90 x^{2} z^{2} + y^{4} + 90 y^{2} z^{2} - 54 z^{4}\right)}{5720}$$

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

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

** symmetry

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

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

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

** expression

$$-\frac{\sqrt{2}Q_1 z}{8}-\frac{\sqrt{30}Q_{3y} z}{8}-\frac{\sqrt{5}Q_{az} y}{4}-\frac{\sqrt{3}Q_{bz} y}{4}$$

$$-\frac{\sqrt{2}Q_2 z}{8}+\frac{\sqrt{30}Q_{3x} z}{8}+\frac{\sqrt{5}Q_{az} x}{4}-\frac{\sqrt{3}Q_{bz} x}{4}$$

$$\frac{\sqrt{2}Q_1 x}{2}+\frac{\sqrt{2}Q_2 y}{2}$$

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

** symmetry

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

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

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

** expression

$$\frac{\sqrt{14}Q_1 z}{8}+\frac{\sqrt{21}Q_3 x}{7}-\frac{\sqrt{210}Q_{3y} z}{56}-\frac{\sqrt{35}Q_{az} y}{28}+\frac{3\sqrt{21}Q_{bz} y}{28}$$

$$-\frac{\sqrt{14}Q_2 z}{8}+\frac{\sqrt{21}Q_3 y}{7}-\frac{\sqrt{210}Q_{3x} z}{56}-\frac{\sqrt{35}Q_{az} x}{28}-\frac{3\sqrt{21}Q_{bz} x}{28}$$

$$-\frac{\sqrt{14}Q_1 x}{28}+\frac{\sqrt{14}Q_2 y}{28}+\frac{\sqrt{21}Q_3 z}{7}+\frac{\sqrt{210}Q_{3x} y}{28}+\frac{\sqrt{210}Q_{3y} x}{28}$$

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

** symmetry

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

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

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

** expression

$$\frac{3\sqrt{11}Q_1 z\left(x^2-4y^2+z^2\right)}{44}-\frac{15\sqrt{11}Q_2 xyz}{44}+\frac{5\sqrt{66}Q_3 x\left(y-z\right)\left(y+z\right)}{44}-\frac{5\sqrt{165}Q_{3x}xyz}{44}+\frac{\sqrt{165}Q_{3y}z\left(3x^2-z^2\right)}{44}+\frac{3\sqrt{110}Q_{az}y\left(x-z\right)\left(x+z\right)}{44}+\frac{\sqrt{66}Q_{bz}y\left(3x^2-2y^2+3z^2\right)}{44}$$

$$-\frac{15\sqrt{11}Q_1 xyz}{44}-\frac{3\sqrt{11}Q_2 z\left(4x^2-y^2-z^2\right)}{44}-\frac{5\sqrt{66}Q_3 y\left(x-z\right)\left(x+z\right)}{44}-\frac{\sqrt{165}Q_{3x}z\left(3y^2-z^2\right)}{44}+\frac{5\sqrt{165}Q_{3y}xyz}{44}-\frac{3\sqrt{110}Q_{az}x\left(y-z\right)\left(y+z\right)}{44}-\frac{\sqrt{66}Q_{bz}x\left(2x^2-3y^2-3z^2\right)}{44}$$

$$\frac{3\sqrt{11}Q_1 x\left(x^2+y^2-4z^2\right)}{44}+\frac{3\sqrt{11}Q_2 y\left(x^2+y^2-4z^2\right)}{44}+\frac{5\sqrt{66}Q_3 z\left(x-y\right)\left(x+y\right)}{44}-\frac{\sqrt{165}Q_{3x}y\left(3x^2-y^2\right)}{44}-\frac{\sqrt{165}Q_{3y}x\left(x^2-3y^2\right)}{44}+\frac{5\sqrt{66}Q_{bz}xyz}{22}$$

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

** symmetry

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

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

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

** expression

$$\frac{3\sqrt{77}Q_1 z\left(13x^2+8y^2-7z^2\right)}{308}-\frac{15\sqrt{77}Q_2 xyz}{308}-\frac{\sqrt{462}Q_3 x\left(2x^2-3y^2-3z^2\right)}{308}+\frac{3\sqrt{1155}Q_{3x}xyz}{308}+\frac{\sqrt{1155}Q_{3y}z\left(7x^2-4y^2-z^2\right)}{308}-\frac{3\sqrt{770}Q_{az}y\left(5x^2-2y^2+z^2\right)}{308}+\frac{\sqrt{462}Q_{bz}y\left(x^2-4y^2+11z^2\right)}{308}$$

$$\frac{15\sqrt{77}Q_1 xyz}{308}-\frac{3\sqrt{77}Q_2 z\left(8x^2+13y^2-7z^2\right)}{308}+\frac{\sqrt{462}Q_3 y\left(3x^2-2y^2+3z^2\right)}{308}-\frac{\sqrt{1155}Q_{3x}z\left(4x^2-7y^2+z^2\right)}{308}+\frac{3\sqrt{1155}Q_{3y}xyz}{308}+\frac{3\sqrt{770}Q_{az}x\left(2x^2-5y^2-z^2\right)}{308}+\frac{\sqrt{462}Q_{bz}x\left(4x^2-y^2-11z^2\right)}{308}$$

$$-\frac{9\sqrt{77}Q_1 x\left(x^2+y^2-4z^2\right)}{308}+\frac{9\sqrt{77}Q_2 y\left(x^2+y^2-4z^2\right)}{308}+\frac{\sqrt{462}Q_3 z\left(3x^2+3y^2-2z^2\right)}{308}+\frac{\sqrt{1155}Q_{3x}y\left(7x^2-5y^2+8z^2\right)}{308}-\frac{\sqrt{1155}Q_{3y}x\left(5x^2-7y^2-8z^2\right)}{308}-\frac{3\sqrt{770}Q_{az}xyz}{154}$$

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

** symmetry

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

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

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

** expression

$$-\frac{3\sqrt{1430}Q_1 z\left(2x^4-87x^2y^2+25x^2z^2+37y^4-45y^2z^2+2z^4\right)}{2288}+\frac{21\sqrt{1430}Q_2 xyz\left(2x^2-7y^2+5z^2\right)}{1144}-\frac{7\sqrt{2145}Q_3 x\left(y-z\right)\left(y+z\right)\left(2x^2-y^2-z^2\right)}{572}+\frac{7\sqrt{858}Q_{3x}xyz\left(10x^2+13y^2-23z^2\right)}{1144}-\frac{\sqrt{858}Q_{3y}z\left(30x^4+39x^2y^2-73x^2z^2-33y^4+53y^2z^2+2z^4\right)}{2288}-\frac{3\sqrt{143}Q_{az}y\left(10x^4+13x^2y^2-99x^2z^2+3y^4-43y^2z^2+38z^4\right)}{1144}-\frac{\sqrt{2145}Q_{bz}y\left(6x^4-37x^2y^2+75x^2z^2-y^4+47y^2z^2-36z^4\right)}{1144}$$

$$-\frac{21\sqrt{1430}Q_1 xyz\left(7x^2-2y^2-5z^2\right)}{1144}-\frac{3\sqrt{1430}Q_2 z\left(37x^4-87x^2y^2-45x^2z^2+2y^4+25y^2z^2+2z^4\right)}{2288}-\frac{7\sqrt{2145}Q_3 y\left(x-z\right)\left(x+z\right)\left(x^2-2y^2+z^2\right)}{572}-\frac{\sqrt{858}Q_{3x}z\left(33x^4-39x^2y^2-53x^2z^2-30y^4+73y^2z^2-2z^4\right)}{2288}-\frac{7\sqrt{858}Q_{3y}xyz\left(13x^2+10y^2-23z^2\right)}{1144}+\frac{3\sqrt{143}Q_{az}x\left(3x^4+13x^2y^2-43x^2z^2+10y^4-99y^2z^2+38z^4\right)}{1144}+\frac{\sqrt{2145}Q_{bz}x\left(x^4+37x^2y^2-47x^2z^2-6y^4-75y^2z^2+36z^4\right)}{1144}$$

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

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

** symmetry

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

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

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

** expression

$$\frac{3\sqrt{10010}Q_1z\left(4x^4+21x^2y^2-15x^2z^2-y^4-5y^2z^2+2z^4\right)}{2288}+\frac{3\sqrt{10010}Q_2xyz\left(2x^2-7y^2+5z^2\right)}{1144}-\frac{\sqrt{15015}Q_3x\left(16x^4-80x^2y^2-80x^2z^2+51y^4-66y^2z^2+51z^4\right)}{4004}-\frac{3\sqrt{6006}Q_{3x}xyz\left(2x^2+9y^2-11z^2\right)}{1144}-\frac{\sqrt{6006}Q_{3y}z\left(268x^4-213x^2y^2-465x^2z^2-187y^4+445y^2z^2+2z^4\right)}{16016}+\frac{3\sqrt{1001}Q_{az}y\left(32x^4+15x^2y^2-237x^2z^2-17y^4+155y^2z^2-38z^4\right)}{8008}+\frac{\sqrt{15015}Q_{bz}y\left(88x^4-195x^2y^2+57x^2z^2+11y^4+85y^2z^2-52z^4\right)}{8008}$$

$$\frac{3\sqrt{10010}Q_1xyz\left(7x^2-2y^2-5z^2\right)}{1144}+\frac{3\sqrt{10010}Q_2z\left(x^4-21x^2y^2+5x^2z^2-4y^4+15y^2z^2-2z^4\right)}{2288}-\frac{\sqrt{15015}Q_3y\left(51x^4-80x^2y^2-66x^2z^2+16y^4-80y^2z^2+51z^4\right)}{4004}+\frac{\sqrt{6006}Q_{3x}z\left(187x^4+213x^2y^2-445x^2z^2-268y^4+465y^2z^2-2z^4\right)}{16016}-\frac{3\sqrt{6006}Q_{3y}xyz\left(9x^2+2y^2-11z^2\right)}{1144}-\frac{3\sqrt{1001}Q_{az}x\left(17x^4-15x^2y^2-155x^2z^2-32y^4+237y^2z^2+38z^4\right)}{8008}-\frac{\sqrt{15015}Q_{bz}x\left(11x^4-195x^2y^2+85x^2z^2+88y^4+57y^2z^2-52z^4\right)}{8008}$$

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

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

** symmetry

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

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

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

** expression

$$\frac{\sqrt{1430}Q_1z\left(2x^6-345x^4y^2+105x^4z^2+1185x^2y^4-1680x^2y^2z^2+105x^2z^4-184y^6+525y^4z^2-147y^2z^4+2z^6\right)}{5720}-\frac{3\sqrt{1430}Q_2xyz\left(18x^4-305x^2y^2+245x^2z^2+249y^4-525y^2z^2+84z^4\right)}{5720}+\frac{3\sqrt{2145}Q_3x\left(y-z\right)\left(y+z\right)\left(3x^4-5x^2y^2-5x^2z^2-8y^4+127y^2z^2-8z^4\right)}{1430}-\frac{3\sqrt{858}Q_{3x}xyz\left(6x^4+45x^2y^2-65x^2z^2+39y^4-175y^2z^2+72z^4\right)}{1144}+\frac{\sqrt{858}Q_{3y}z\left(2x^6+15x^4y^2-15x^4z^2-75x^2y^4+120x^2y^2z^2-3x^2z^4-88y^6+465y^4z^2-291y^2z^4+14z^6\right)}{1144}+\frac{\sqrt{143}Q_{az}y\left(2x^6+15x^4y^2-75x^4z^2+24x^2y^4-330x^2y^2z^2+240x^2z^4+11y^6-255y^4z^2+480y^2z^4-112z^6\right)}{572}+\frac{\sqrt{2145}Q_{bz}y\left(2x^6-45x^4y^2+105x^4z^2-30x^2y^4+570x^2y^2z^2-390x^2z^4+17y^6-327y^4z^2+450y^2z^4-64z^6\right)}{2860}$$

$$-\frac{3\sqrt{1430}Q_{1}xyz\left(249x^{4}-305x^{2}y^{2}-525x^{2}z^{2}+18y^{4}+245y^{2}z^{2}+84z^{4}\right)}{5720}$$
$$-\frac{\sqrt{1430}Q_{2}z\left(184x^{6}-1185x^{4}y^{2}-525x^{4}z^{2}+345x^{2}y^{4}+1680x^{2}y^{2}z^{2}+147x^{2}z^{4}-2y^{6}-105y^{4}z^{2}-105y^{2}z^{4}-2z^{6}\right)}{5720}$$
$$+\frac{3\sqrt{2145}Q_{3}y\left(x-z\right)\left(x+z\right)\left(8x^{4}+5x^{2}y^{2}-127x^{2}z^{2}-3y^{4}+5y^{2}z^{2}+8z^{4}\right)}{1430}$$
$$+\frac{\sqrt{858}Q_{3x}z\left(88x^{6}+75x^{4}y^{2}-465x^{4}z^{2}-15x^{2}y^{4}-120x^{2}y^{2}z^{2}+291x^{2}z^{4}-2y^{6}+15y^{4}z^{2}+3y^{2}z^{4}-14z^{6}\right)}{1144}$$
$$+\frac{3\sqrt{858}Q_{3y}xyz\left(39x^{4}+45x^{2}y^{2}-175x^{2}z^{2}+6y^{4}-65y^{2}z^{2}+72z^{4}\right)}{1144}$$
$$-\frac{\sqrt{143}Q_{az}x\left(11x^{6}+24x^{4}y^{2}-255x^{4}z^{2}+15x^{2}y^{4}-330x^{2}y^{2}z^{2}+480x^{2}z^{4}+2y^{6}-75y^{4}z^{2}+240y^{2}z^{4}-112z^{6}\right)}{572}$$
$$+\frac{\sqrt{2145}Q_{bz}x\left(17x^{6}-30x^{4}y^{2}-327x^{4}z^{2}-45x^{2}y^{4}+570x^{2}y^{2}z^{2}+450x^{2}z^{4}+2y^{6}+105y^{4}z^{2}-390y^{2}z^{4}-64z^{6}\right)}{2860}$$

$$-\frac{\sqrt{1430}Q_{1}x\left(53x^{6}-1128x^{4}y^{2}+15x^{4}z^{2}+1875x^{2}y^{4}+30x^{2}y^{2}z^{2}-30x^{2}z^{4}-376y^{6}+15y^{4}z^{2}-30y^{2}z^{4}+8z^{6}\right)}{5720}$$
$$+\frac{\sqrt{1430}Q_{2}y\left(376x^{6}-1875x^{4}y^{2}-15x^{4}z^{2}+1128x^{2}y^{4}-30x^{2}y^{2}z^{2}+30x^{2}z^{4}-53y^{6}-15y^{4}z^{2}+30y^{2}z^{4}-8z^{6}\right)}{5720}$$
$$-\frac{3\sqrt{2145}Q_{3}z\left(x-y\right)\left(x+y\right)\left(8x^{4}-127x^{2}y^{2}+5x^{2}z^{2}+8y^{4}+5y^{2}z^{2}-3z^{4}\right)}{1430}$$
$$-\frac{3\sqrt{858}Q_{3x}y\left(8x^{6}-5x^{4}y^{2}-105x^{4}z^{2}-12x^{2}y^{4}+150x^{2}y^{2}z^{2}+30x^{2}z^{4}+y^{6}-9y^{4}z^{2}-10y^{2}z^{4}\right)}{1144}$$
$$+\frac{3\sqrt{858}Q_{3y}x\left(x^{6}-12x^{4}y^{2}-9x^{4}z^{2}-5x^{2}y^{4}+150x^{2}y^{2}z^{2}-10x^{2}z^{4}+8y^{6}-105y^{4}z^{2}+30y^{2}z^{4}\right)}{1144}$$
$$-\frac{3\sqrt{143}Q_{az}xyz\left(x-y\right)\left(x+y\right)\left(3x^{2}+3y^{2}-10z^{2}\right)}{52}+\frac{3\sqrt{2145}Q_{bz}xyz\left(111x^{4}-350x^{2}y^{2}-20x^{2}z^{2}+111y^{4}-20y^{2}z^{2}+12z^{4}\right)}{2860}$$

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

** symmetry

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

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

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

** expression

$$-\frac{\sqrt{10010}Q_{1}z\left(56x^{6}-885x^{4}y^{2}+15x^{4}z^{2}+735x^{2}y^{4}+300x^{2}y^{2}z^{2}-39x^{2}z^{4}-40y^{6}-45y^{4}z^{2}-3y^{2}z^{4}+2z^{6}\right)}{5720}$$
$$+\frac{3\sqrt{10010}Q_{2}xyz\left(120x^{4}-365x^{2}y^{2}-35x^{2}z^{2}+87y^{4}+75y^{2}z^{2}-12z^{4}\right)}{5720}$$
$$+\frac{\sqrt{15015}Q_{3}x\left(2x^{6}-21x^{4}y^{2}-21x^{4}z^{2}-15x^{2}y^{4}+300x^{2}y^{2}z^{2}-15x^{2}z^{4}+8y^{6}-75y^{4}z^{2}-75y^{2}z^{4}+8z^{6}\right)}{1430}$$
$$-\frac{3\sqrt{6006}Q_{3x}xyz\left(24x^{4}+15x^{2}y^{2}-95x^{2}z^{2}-9y^{4}+15y^{2}z^{2}+24z^{4}\right)}{1144}$$
$$+\frac{\sqrt{6006}Q_{3y}z\left(8x^{6}-75x^{4}y^{2}-15x^{4}z^{2}-75x^{2}y^{4}+300x^{2}y^{2}z^{2}-21x^{2}z^{4}+8y^{6}-15y^{4}z^{2}-21y^{2}z^{4}+2z^{6}\right)}{1144}$$
$$+\frac{\sqrt{1001}Q_{az}y\left(8x^{6}+15x^{4}y^{2}-165x^{4}z^{2}+6x^{2}y^{4}-150x^{2}y^{2}z^{2}+240x^{2}z^{4}-y^{6}+15y^{4}z^{2}-16z^{6}\right)}{572}$$
$$-\frac{3\sqrt{15015}Q_{bz}y\left(8x^{6}-5x^{4}y^{2}-105x^{4}z^{2}-12x^{2}y^{4}+150x^{2}y^{2}z^{2}+30x^{2}z^{4}+y^{6}-9y^{4}z^{2}-10y^{2}z^{4}\right)}{2860}$$

$$-\frac{3\sqrt{10010}Q_{1}xyz\left(87x^{4}-365x^{2}y^{2}+75x^{2}z^{2}+120y^{4}-35y^{2}z^{2}-12z^{4}\right)}{5720}$$
$$-\frac{\sqrt{10010}Q_{2}z\left(40x^{6}-735x^{4}y^{2}+45x^{4}z^{2}+885x^{2}y^{4}-300x^{2}y^{2}z^{2}+3x^{2}z^{4}-56y^{6}-15y^{4}z^{2}+39y^{2}z^{4}-2z^{6}\right)}{5720}$$
$$+\frac{\sqrt{15015}Q_{3}y\left(8x^{6}-15x^{4}y^{2}-75x^{4}z^{2}-21x^{2}y^{4}+300x^{2}y^{2}z^{2}-75x^{2}z^{4}+2y^{6}-21y^{4}z^{2}-15y^{2}z^{4}+8z^{6}\right)}{1430}$$
$$+\frac{\sqrt{6006}Q_{3x}z\left(8x^{6}-75x^{4}y^{2}-15x^{4}z^{2}-75x^{2}y^{4}+300x^{2}y^{2}z^{2}-21x^{2}z^{4}+8y^{6}-15y^{4}z^{2}-21y^{2}z^{4}+2z^{6}\right)}{1144}$$
$$+\frac{3\sqrt{6006}Q_{3y}xyz\left(9x^{4}-15x^{2}y^{2}-15x^{2}z^{2}-24y^{4}+95y^{2}z^{2}-24z^{4}\right)}{1144}$$
$$-\frac{\sqrt{1001}Q_{az}x\left(x^{6}-6x^{4}y^{2}-15x^{4}z^{2}-15x^{2}y^{4}+150x^{2}y^{2}z^{2}-8y^{6}+165y^{4}z^{2}-240y^{2}z^{4}+16z^{6}\right)}{572}$$
$$+\frac{3\sqrt{15015}Q_{bz}x\left(x^{6}-12x^{4}y^{2}-9x^{4}z^{2}-5x^{2}y^{4}+150x^{2}y^{2}z^{2}-10x^{2}z^{4}+8y^{6}-105y^{4}z^{2}+30y^{2}z^{4}\right)}{2860}$$

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