PG No. 23 $C_{6\mathrm{h}}$ $6/m$ [hexagonal] (polar, internal axial quadrupole)

* Harmonics for rank 0
* Harmonics for rank 1

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

** symmetry

z

** expression

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

$\vec{\mathbb{Q}}_{1,1}^{(2,1)}[g](E_{1u})$, $\vec{\mathbb{Q}}_{1,2}^{(2,1)}[g](E_{1u})$

** symmetry

x

y

** expression

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

$$\frac{3\sqrt{10}G_u xz}{10} - \frac{\sqrt{30}G_v xz}{10} - \frac{\sqrt{30}G_{xy}yz}{10} + \frac{\sqrt{30}G_{xz}\left(x-z\right)\left(x+z\right)}{10} + \frac{\sqrt{30}G_{yz}xy}{10}$$

* Harmonics for rank 2

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

** symmetry

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

** expression

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

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

** symmetry

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

** expression

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

$\vec{\mathbb{Q}}_{2,1}^{(2,-1)}[g](E_{1g})$, $\vec{\mathbb{Q}}_{2,2}^{(2,-1)}[g](E_{1g})$

** symmetry

$\sqrt{3}yz$

$-\sqrt{3}xz$

** expression

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

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

$\vec{\mathbb{Q}}_{2,1}^{(2,1)}[g](E_{1g})$, $\vec{\mathbb{Q}}_{2,2}^{(2,1)}[g](E_{1g})$

** symmetry

$\sqrt{3}yz$

$-\sqrt{3}xz$

** expression

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

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

$\vec{\mathbb{Q}}_{2,1}^{(2,-1)}[g](E_{2g})$, $\vec{\mathbb{Q}}_{2,2}^{(2,-1)}[g](E_{2g})$

** symmetry

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

$$-\sqrt{3}xy$$

** expression

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

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

$\vec{\mathbb{Q}}_{2,1}^{(2,1)}[g](E_{2g})$, $\vec{\mathbb{Q}}_{2,2}^{(2,1)}[g](E_{2g})$

** symmetry

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

$$-\sqrt{3}xy$$

** expression

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

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

* Harmonics for rank 3

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

** symmetry

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

** expression

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

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

** symmetry

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

** expression

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

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

** symmetry

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

** expression

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

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

** symmetry

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

** expression

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

$\vec{\mathbb{Q}}_3^{(2,1)}[g](B_u,1)$
** symmetry

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

** expression

$$\frac{7\sqrt{2}G_u xz\left(x^2-3y^2\right)}{8}-\frac{\sqrt{6}G_v xz\left(3x^2+3y^2-4z^2\right)}{24}+\frac{\sqrt{6}G_{xy}yz\left(3x^2+3y^2-4z^2\right)}{24}$$
$$+\frac{\sqrt{6}G_{xz}\left(5x^4-21x^2y^2-9x^2z^2+2y^4+9y^2z^2\right)}{24}+\frac{\sqrt{6}G_{yz}xy\left(11x^2-17y^2+18z^2\right)}{24}$$

$\vec{\mathbb{Q}}_3^{(2,1)}[g](B_u,2)$
** symmetry

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

** expression

$$-\frac{7\sqrt{2}G_u yz\left(3x^2-y^2\right)}{8}+\frac{\sqrt{6}G_v yz\left(3x^2+3y^2-4z^2\right)}{24}+\frac{\sqrt{6}G_{xy}xz\left(3x^2+3y^2-4z^2\right)}{24}$$
$$-\frac{\sqrt{6}G_{xz}xy\left(17x^2-11y^2-18z^2\right)}{24}+\frac{\sqrt{6}G_{yz}\left(2x^4-21x^2y^2+9x^2z^2+5y^4-9y^2z^2\right)}{24}$$

$\vec{\mathbb{Q}}_{3,1}^{(2,-1)}[g](E_{1u})$, $\vec{\mathbb{Q}}_{3,2}^{(2,-1)}[g](E_{1u})$
** 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

$$-\frac{\sqrt{15}G_u yz}{5}+\frac{3\sqrt{5}G_v yz}{10}-\frac{3\sqrt{5}G_{xy}xz}{10}+\frac{3\sqrt{5}G_{xz}xy}{10}-\frac{\sqrt{5}G_{yz}\left(5x^2-y^2-4z^2\right)}{20}$$

$$\frac{\sqrt{15}G_u xz}{5}+\frac{3\sqrt{5}G_v xz}{10}+\frac{3\sqrt{5}G_{xy}yz}{10}-\frac{\sqrt{5}G_{xz}\left(x^2-5y^2+4z^2\right)}{20}-\frac{3\sqrt{5}G_{yz}xy}{10}$$

$\vec{\mathbb{Q}}_{3,1}^{(2,1)}[g](E_{1u})$, $\vec{\mathbb{Q}}_{3,2}^{(2,1)}[g](E_{1u})$
** 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

$$\frac{\sqrt{30}G_u yz\left(3x^2+3y^2-4z^2\right)}{24}+\frac{\sqrt{10}G_v yz\left(27x^2-y^2-8z^2\right)}{24}-\frac{\sqrt{10}G_{xy}xz\left(13x^2-15y^2-8z^2\right)}{24}$$
$$-\frac{\sqrt{10}G_{xz}xy\left(x^2+y^2-6z^2\right)}{24}+\frac{\sqrt{10}G_{yz}\left(2x^4+3x^2y^2-15x^2z^2+y^4-9y^2z^2+4z^4\right)}{24}$$

$$-\frac{\sqrt{30}G_u xz\left(3x^2+3y^2-4z^2\right)}{24}-\frac{\sqrt{10}G_v xz\left(x^2-27y^2+8z^2\right)}{24}-\frac{\sqrt{10}G_{xy}yz\left(15x^2-13y^2+8z^2\right)}{24}$$
$$-\frac{\sqrt{10}G_{xz}\left(x^4+3x^2y^2-9x^2z^2+2y^4-15y^2z^2+4z^4\right)}{24}+\frac{\sqrt{10}G_{yz}xy\left(x^2+y^2-6z^2\right)}{24}$$

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

$$\sqrt{15}xyz$$

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

** expression

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

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

$\vec{\mathbb{Q}}_{3,1}^{(2,1)}[g](E_{2u})$, $\vec{\mathbb{Q}}_{3,2}^{(2,1)}[g](E_{2u})$

** symmetry

$$\sqrt{15}xyz$$

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

** expression

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

$$\frac{\sqrt{3}G_u xy\left(x^2+y^2-6z^2\right)}{3} + \frac{7G_v xy\,(x-y)\,(x+y)}{6} - \frac{G_{xy}\left(5x^4-18x^2y^2-12x^2z^2+5y^4-12y^2z^2+4z^4\right)}{12}$$
$$-\frac{7G_{xz}yz\left(3x^2+y^2-2z^2\right)}{12} - \frac{7G_{yz}xz\left(x^2+3y^2-2z^2\right)}{12}$$

* Harmonics for rank 4

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

** symmetry

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

** expression

$$-\frac{\sqrt{105}G_v xyz}{7} + \frac{\sqrt{105}G_{xy}z\,(x-y)\,(x+y)}{14} - \frac{\sqrt{105}G_{xz}y\left(x^2+y^2-4z^2\right)}{28} + \frac{\sqrt{105}G_{yz}x\left(x^2+y^2-4z^2\right)}{28}$$

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

** symmetry

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

** expression

$$-\frac{7\sqrt{330}G_v xyz\left(x^2+y^2-2z^2\right)}{44} + \frac{7\sqrt{330}G_{xy}z\,(x-y)\,(x+y)\left(x^2+y^2-2z^2\right)}{88}$$
$$+\frac{\sqrt{330}G_{xz}y\left(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4\right)}{88} - \frac{\sqrt{330}G_{yz}x\left(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4\right)}{88}$$

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

** symmetry

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

** expression

$$-\frac{3\sqrt{2}G_u y\left(3x^2-y^2\right)}{8} - \frac{\sqrt{6}G_v y\left(x^2+y^2-4z^2\right)}{8} - \frac{\sqrt{6}G_{xy}x\left(x^2+y^2-4z^2\right)}{8} - \frac{\sqrt{6}G_{xz}xyz}{4} - \frac{\sqrt{6}G_{yz}z\,(x-y)\,(x+y)}{8}$$

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

** symmetry

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

** expression

$$\frac{3\sqrt{2}G_u x\left(x^2-3y^2\right)}{8} + \frac{\sqrt{6}G_v x\left(x^2+y^2-4z^2\right)}{8} - \frac{\sqrt{6}G_{xy}y\left(x^2+y^2-4z^2\right)}{8} + \frac{\sqrt{6}G_{xz}z\,(x-y)\,(x+y)}{8} - \frac{\sqrt{6}G_{yz}xyz}{4}$$

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

** symmetry

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

** expression

$$\frac{3\sqrt{77}G_u y\left(3x^2-y^2\right)\left(x^2+y^2-8z^2\right)}{88} + \frac{\sqrt{231}G_v y\left(7x^4-16x^2y^2+6x^2z^2+y^4+6y^2z^2-4z^4\right)}{88}$$
$$-\frac{\sqrt{231}G_{xy}x\left(x^4-7x^2y^2-3x^2z^2+4y^4-3y^2z^2+2z^4\right)}{44} - \frac{\sqrt{231}G_{xz}xyz\left(11x^2-y^2-10z^2\right)}{44} - \frac{\sqrt{231}G_{yz}z\left(x^4+9x^2y^2-5x^2z^2-4y^4+5y^2z^2\right)}{44}$$

$\vec{\mathbb{Q}}_4^{(2,1)}[g](B_g, 2)$
** symmetry

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

** expression

$$-\frac{3\sqrt{77}G_u x\left(x^2-3y^2\right)\left(x^2+y^2-8z^2\right)}{88}-\frac{\sqrt{231}G_v x\left(x^4-16x^2y^2+6x^2z^2+7y^4+6y^2z^2-4z^4\right)}{88}$$
$$-\frac{\sqrt{231}G_{xy}y\left(4x^4-7x^2y^2-3x^2z^2+y^4-3y^2z^2+2z^4\right)}{44}+\frac{\sqrt{231}G_{xz}z\left(4x^4-9x^2y^2-5x^2z^2-y^4+5y^2z^2\right)}{44}+\frac{\sqrt{231}G_{yz}xyz\left(x^2-11y^2+10z^2\right)}{44}$$

$\vec{\mathbb{Q}}_{4,1}^{(2,-1)}[g](E_{1g})$, $\vec{\mathbb{Q}}_{4,2}^{(2,-1)}[g](E_{1g})$
** 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

$$-\frac{3\sqrt{14}G_u x\left(x^2+y^2-4z^2\right)}{56}-\frac{\sqrt{42}G_v x\left(x^2+5y^2-8z^2\right)}{56}+\frac{\sqrt{42}G_{xy}y\left(x^2-3y^2+8z^2\right)}{56}-\frac{\sqrt{42}G_{xz}z\left(x^2-13y^2+4z^2\right)}{56}-\frac{\sqrt{42}G_{yz}xyz}{4}$$

$$-\frac{3\sqrt{14}G_u y\left(x^2+y^2-4z^2\right)}{56}+\frac{\sqrt{42}G_v y\left(5x^2+y^2-8z^2\right)}{56}-\frac{\sqrt{42}G_{xy}x\left(3x^2-y^2-8z^2\right)}{56}-\frac{\sqrt{42}G_{xz}xyz}{4}+\frac{\sqrt{42}G_{yz}z\left(13x^2-y^2-4z^2\right)}{56}$$

$\vec{\mathbb{Q}}_{4,1}^{(2,1)}[g](E_{1g})$, $\vec{\mathbb{Q}}_{4,2}^{(2,1)}[g](E_{1g})$
** 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

$$\frac{3\sqrt{11}G_u x\left(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4\right)}{88}+\frac{\sqrt{33}G_v x\left(x^4-12x^2y^2+2x^2z^2-13y^4+114y^2z^2-20z^4\right)}{88}$$
$$+\frac{\sqrt{33}G_{xy}y\left(4x^4+x^2y^2-27x^2z^2-3y^4+29y^2z^2-10z^4\right)}{44}$$
$$-\frac{\sqrt{33}G_{xz}z\left(4x^4+15x^2y^2-13x^2z^2+11y^4-27y^2z^2+4z^4\right)}{44}+\frac{7\sqrt{33}G_{yz}xyz\left(x^2+y^2-2z^2\right)}{44}$$

$$\frac{3\sqrt{11}G_u y\left(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4\right)}{88}+\frac{\sqrt{33}G_v y\left(13x^4+12x^2y^2-114x^2z^2-y^4-2y^2z^2+20z^4\right)}{88}$$
$$-\frac{\sqrt{33}G_{xy}x\left(3x^4-x^2y^2-29x^2z^2-4y^4+27y^2z^2+10z^4\right)}{44}+\frac{7\sqrt{33}G_{xz}xyz\left(x^2+y^2-2z^2\right)}{44}$$
$$-\frac{\sqrt{33}G_{yz}z\left(11x^4+15x^2y^2-27x^2z^2+4y^4-13y^2z^2+4z^4\right)}{44}$$

$\vec{\mathbb{Q}}_{4,1}^{(2,-1)}[g](E_{2g}, 1)$, $\vec{\mathbb{Q}}_{4,2}^{(2,-1)}[g](E_{2g}, 1)$
** 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

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

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

$\vec{\mathbb{Q}}_{4,1}^{(2,-1)}[g](E_{2g}, 2)$, $\vec{\mathbb{Q}}_{4,2}^{(2,-1)}[g](E_{2g}, 2)$

** symmetry

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

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

** expression

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

$$-\frac{3\sqrt{7}G_u z\,(x-y)\,(x+y)}{7}-\frac{\sqrt{21}G_v z\left(3x^2+3y^2-2z^2\right)}{14}+\frac{\sqrt{21}G_{xz}x\left(x^2-5y^2+2z^2\right)}{28}+\frac{\sqrt{21}G_{yz}y\left(5x^2-y^2-2z^2\right)}{28}$$

$\vec{\mathbb{Q}}^{(2,1)}_{4,1}[g](E_{2g},1)$, $\vec{\mathbb{Q}}^{(2,1)}_{4,2}[g](E_{2g},1)$

** symmetry

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

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

** expression

$$-\frac{9\sqrt{154}G_u xyz\,(x-y)\,(x+y)}{22}+\frac{\sqrt{462}G_v xyz\left(x^2+y^2-2z^2\right)}{44}+\frac{\sqrt{462}G_{xy}z\,(x-y)\,(x+y)\left(x^2+y^2-2z^2\right)}{88}$$
$$-\frac{\sqrt{462}G_{xz}y\left(9x^4-14x^2y^2-12x^2z^2+y^4+4y^2z^2\right)}{88}+\frac{\sqrt{462}G_{yz}x\left(x^4-14x^2y^2+4x^2z^2+9y^4-12y^2z^2\right)}{88}$$

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

$\vec{\mathbb{Q}}^{(2,1)}_{4,1}[g](E_{2g},2)$, $\vec{\mathbb{Q}}^{(2,1)}_{4,2}[g](E_{2g},2)$

** symmetry

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

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

** expression

$$\frac{21\sqrt{22}G_u xyz\left(x^2+y^2-2z^2\right)}{44}+\frac{21\sqrt{66}G_v xyz\,(x-y)\,(x+y)}{44}-\frac{\sqrt{66}G_{xy}z\left(9x^4-24x^2y^2-10x^2z^2+9y^4-10y^2z^2+2z^4\right)}{44}$$
$$+\frac{\sqrt{66}G_{xz}y\left(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4\right)}{44}+\frac{\sqrt{66}G_{yz}x\left(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4\right)}{44}$$

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