

PG No. 3 C_2 2 (b-axis setting) [monoclinic] (axial, internal axial quadrupole)

* Harmonics for rank 0

$$\vec{\mathbb{G}}_0^{(2,2)}[g](A)$$

** symmetry

1

** expression

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

* Harmonics for rank 1

$$\vec{\mathbb{G}}_1^{(2,0)}[g](A)$$

** symmetry

y

** expression

$$-\frac{\sqrt{10}G_uy}{10} - \frac{\sqrt{30}G_vy}{10} + \frac{\sqrt{30}G_{xy}x}{10} + \frac{\sqrt{30}G_{yz}z}{10}$$

$$\vec{\mathbb{G}}_1^{(2,2)}[g](A)$$

** symmetry

y

** expression

$$-\frac{3\sqrt{35}G_uy(x^2 + y^2 - 4z^2)}{70} + \frac{\sqrt{105}G_vy(7x^2 - 3y^2 + 2z^2)}{70} - \frac{\sqrt{105}G_{xy}x(x^2 - 4y^2 + z^2)}{35} + \frac{\sqrt{105}G_{xz}xyz}{7} - \frac{\sqrt{105}G_{yz}z(x^2 - 4y^2 + z^2)}{35}$$

$$\vec{\mathbb{G}}_1^{(2,0)}[g](B, 1)$$

** symmetry

x

** expression

$$-\frac{\sqrt{10}G_ux}{10} + \frac{\sqrt{30}G_vx}{10} + \frac{\sqrt{30}G_{xy}y}{10} + \frac{\sqrt{30}G_{xz}z}{10}$$

$$\vec{\mathbb{G}}_1^{(2,0)}[g](B, 2)$$

** symmetry

z

** expression

$$\frac{\sqrt{10}G_uz}{5} + \frac{\sqrt{30}G_{xz}x}{10} + \frac{\sqrt{30}G_{yz}y}{10}$$

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

** symmetry

x

** expression

$$-\frac{3\sqrt{35}G_ux(x^2 + y^2 - 4z^2)}{70} + \frac{\sqrt{105}G_vx(3x^2 - 7y^2 - 2z^2)}{70} + \frac{\sqrt{105}G_{xy}y(4x^2 - y^2 - z^2)}{35} + \frac{\sqrt{105}G_{xz}z(4x^2 - y^2 - z^2)}{35} + \frac{\sqrt{105}G_{yz}xyz}{7}$$

$$\vec{\mathbb{G}}_1^{(2,2)}[g](B, 2)$$

** symmetry

z

** expression

$$-\frac{3\sqrt{35}G_uz(3x^2 + 3y^2 - 2z^2)}{70} + \frac{\sqrt{105}G_vz(x - y)(x + y)}{14} + \frac{\sqrt{105}G_{xy}xyz}{7} - \frac{\sqrt{105}G_{xz}x(x^2 + y^2 - 4z^2)}{35} - \frac{\sqrt{105}G_{yz}y(x^2 + y^2 - 4z^2)}{35}$$

* Harmonics for rank 2

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

** symmetry

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

** expression

$$G_u$$

$\vec{\mathbb{G}}_2^{(2,-2)}[g](A, 2)$

** symmetry

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

** expression

$$G_v$$

$\vec{\mathbb{G}}_2^{(2,-2)}[g](A, 3)$

** symmetry

$$\sqrt{3}xz$$

** expression

$$G_{xz}$$

$\vec{\mathbb{G}}_2^{(2,0)}[g](A, 1)$

** symmetry

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

** expression

$$-\frac{\sqrt{14}G_u(x^2 + y^2 - 2z^2)}{14} - \frac{\sqrt{42}G_v(x-y)(x+y)}{14} - \frac{\sqrt{42}G_{xy}xy}{7} + \frac{\sqrt{42}G_{xz}xz}{14} + \frac{\sqrt{42}G_{yz}yz}{14}$$

$\vec{\mathbb{G}}_2^{(2,0)}[g](A, 2)$

** symmetry

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

** expression

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

$\vec{\mathbb{G}}_2^{(2,0)}[g](A, 3)$

** symmetry

$$\sqrt{3}xz$$

** expression

$$\frac{\sqrt{42}G_uxz}{14} + \frac{3\sqrt{14}G_vxz}{14} + \frac{3\sqrt{14}G_{xy}yz}{14} + \frac{\sqrt{14}G_{xz}(x^2 - 2y^2 + z^2)}{14} + \frac{3\sqrt{14}G_{yz}xy}{14}$$

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

** symmetry

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

** expression

$$\begin{aligned} & \frac{\sqrt{14}G_u(3x^4 + 6x^2y^2 - 24x^2z^2 + 3y^4 - 24y^2z^2 + 8z^4)}{56} - \frac{5\sqrt{42}G_v(x-y)(x+y)(x^2 + y^2 - 6z^2)}{168} \\ & - \frac{5\sqrt{42}G_{xy}xy(x^2 + y^2 - 6z^2)}{84} - \frac{5\sqrt{42}G_{xz}xz(3x^2 + 3y^2 - 4z^2)}{84} - \frac{5\sqrt{42}G_{yz}yz(3x^2 + 3y^2 - 4z^2)}{84} \end{aligned}$$

$\vec{\mathbb{G}}_2^{(2,2)}[g](A, 2)$

** symmetry

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

** expression

$$\begin{aligned} & -\frac{5\sqrt{42}G_u(x-y)(x+y)(x^2 + y^2 - 6z^2)}{168} + \frac{\sqrt{14}G_v(19x^4 - 102x^2y^2 - 12x^2z^2 + 19y^4 - 12y^2z^2 + 4z^4)}{168} \\ & + \frac{5\sqrt{14}G_{xy}xy(x-y)(x+y)}{12} + \frac{5\sqrt{14}G_{xz}xz(5x^2 - 9y^2 - 2z^2)}{84} + \frac{5\sqrt{14}G_{yz}yz(9x^2 - 5y^2 + 2z^2)}{84} \end{aligned}$$

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

** symmetry

$$\sqrt{3}xz$$

** expression

$$-\frac{5\sqrt{42}G_uxz(3x^2+3y^2-4z^2)}{84} + \frac{5\sqrt{14}G_vxz(5x^2-9y^2-2z^2)}{84} + \frac{5\sqrt{14}G_{xy}yz(6x^2-y^2-z^2)}{42} \\ - \frac{\sqrt{14}G_{xz}(4x^4+3x^2y^2-27x^2z^2-y^4+3y^2z^2+4z^4)}{42} - \frac{5\sqrt{14}G_{yz}xy(x^2+y^2-6z^2)}{42}$$

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

** symmetry

$$\sqrt{3}yz$$

** expression

$$G_{yz}$$

$$\vec{\mathbb{G}}_2^{(2,-2)}[g](B, 2)$$

** symmetry

$$\sqrt{3}xy$$

** expression

$$G_{xy}$$

$$\vec{\mathbb{G}}_2^{(2,0)}[g](B, 1)$$

** symmetry

$$\sqrt{3}yz$$

** expression

$$-\frac{\sqrt{42}G_uyz}{14} - \frac{3\sqrt{14}G_vyz}{14} + \frac{3\sqrt{14}G_{xy}xz}{14} + \frac{3\sqrt{14}G_{xz}xy}{14} - \frac{\sqrt{14}G_{yz}(2x^2-y^2-z^2)}{14}$$

$$\vec{\mathbb{G}}_2^{(2,0)}[g](B, 2)$$

** symmetry

$$\sqrt{3}xy$$

** expression

$$-\frac{\sqrt{42}G_uxy}{7} + \frac{\sqrt{14}G_{xy}(x^2+y^2-2z^2)}{14} + \frac{3\sqrt{14}G_{xz}yz}{14} + \frac{3\sqrt{14}G_{yz}xz}{14}$$

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

** symmetry

$$\sqrt{3}yz$$

** expression

$$-\frac{5\sqrt{42}G_uyz(3x^2+3y^2-4z^2)}{84} + \frac{5\sqrt{14}G_vyz(9x^2-5y^2+2z^2)}{84} - \frac{5\sqrt{14}G_{xy}xz(x^2-6y^2+z^2)}{42} \\ - \frac{5\sqrt{14}G_{xz}xy(x^2+y^2-6z^2)}{42} + \frac{\sqrt{14}G_{yz}(x^4-3x^2y^2-3x^2z^2-4y^4+27y^2z^2-4z^4)}{42}$$

$$\vec{\mathbb{G}}_2^{(2,2)}[g](B, 2)$$

** symmetry

$$\sqrt{3}xy$$

** expression

$$-\frac{5\sqrt{42}G_uxy(x^2+y^2-6z^2)}{84} + \frac{5\sqrt{14}G_vxy(x-y)(x+y)}{12} - \frac{\sqrt{14}G_{xy}(4x^4-27x^2y^2+3x^2z^2+4y^4+3y^2z^2-z^4)}{42} \\ + \frac{5\sqrt{14}G_{xz}yz(6x^2-y^2-z^2)}{42} - \frac{5\sqrt{14}G_{yz}xz(x^2-6y^2+z^2)}{42}$$

* Harmonics for rank 3

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

** symmetry

$$\sqrt{15}xyz$$

** expression

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

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

** symmetry

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

** expression

$$-\frac{\sqrt{15}G_{uy}}{10} - \frac{3\sqrt{5}G_{vy}}{10} - \frac{\sqrt{5}G_{xy}x}{5} - \frac{\sqrt{5}G_{yz}z}{5}$$

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

** symmetry

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

** expression

$$\frac{G_{uy}}{2} - \frac{\sqrt{3}G_{vy}}{6} - \frac{\sqrt{3}G_{xy}x}{3} + \frac{\sqrt{3}G_{yz}z}{3}$$

$$\tilde{\mathbb{G}}_3^{(2,0)}[g](A, 1)$$

** symmetry

$$\sqrt{15}xyz$$

** expression

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

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

** symmetry

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

** expression

$$\frac{\sqrt{15}G_{uy}(21x^2 - 4y^2 - 9z^2)}{60} + \frac{\sqrt{5}G_{vy}(x^2 - 4y^2 + 11z^2)}{20} - \frac{\sqrt{5}G_{xy}x(x^2 - 4y^2 + z^2)}{20} - \sqrt{5}G_{xz}xyz - \frac{\sqrt{5}G_{yz}z(x^2 - 4y^2 + z^2)}{20}$$

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

** symmetry

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

** expression

$$\frac{G_{uy}(3x^2 - 2y^2 + 3z^2)}{4} - \frac{\sqrt{3}G_{vy}(3x^2 - 2y^2 + 3z^2)}{12} - \frac{\sqrt{3}G_{xy}x(x^2 + 6y^2 - 9z^2)}{12} - \frac{\sqrt{3}G_{yz}z(9x^2 - 6y^2 - z^2)}{12}$$

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

** symmetry

$$\sqrt{15}xyz$$

** expression

$$-\frac{21\sqrt{22}G_{uy}xyz(x^2 + y^2 - 2z^2)}{44} + \frac{21\sqrt{66}G_vxyz(x-y)(x+y)}{44} - \frac{\sqrt{66}G_{xy}z(6x^4 - 51x^2y^2 + 5x^2z^2 + 6y^4 + 5y^2z^2 - z^4)}{66} \\ - \frac{\sqrt{66}G_{xz}y(6x^4 + 5x^2y^2 - 51x^2z^2 - y^4 + 5y^2z^2 + 6z^4)}{66} + \frac{\sqrt{66}G_{yz}x(x^4 - 5x^2y^2 - 5x^2z^2 - 6y^4 + 51y^2z^2 - 6z^4)}{66}$$

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

** symmetry

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

** expression

$$+\frac{\sqrt{330}G_{uy}\left(3x^4-x^2y^2-15x^2z^2-4y^4+41y^2z^2-18z^4\right)}{264}-\frac{\sqrt{110}G_vy\left(11x^4-27x^2y^2+15x^2z^2+4y^4-13y^2z^2+4z^4\right)}{88}$$

$$+\frac{\sqrt{110}G_{xy}x\left(x^4-12x^2y^2+2x^2z^2+8y^4-12y^2z^2+z^4\right)}{44}-\frac{7\sqrt{110}G_{xz}xyz\left(x^2-2y^2+z^2\right)}{44}+\frac{\sqrt{110}G_{yz}z\left(x^4-12x^2y^2+2x^2z^2+8y^4-12y^2z^2+z^4\right)}{44}$$

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

** symmetry

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

** expression

$$\frac{\sqrt{22}G_{uy}\left(9x^4+11x^2y^2-87x^2z^2+2y^4-31y^2z^2+30z^4\right)}{88}-\frac{\sqrt{66}G_vy\left(51x^4-73x^2y^2-87x^2z^2+2y^4+53y^2z^2-12z^4\right)}{264}$$

$$+\frac{\sqrt{66}G_{xy}x\left(5x^4-46x^2y^2-4x^2z^2+12y^4+66y^2z^2-9z^4\right)}{132}-\frac{21\sqrt{66}G_{xz}xyz(x-z)(x+z)}{44}$$

$$+\frac{\sqrt{66}G_{yz}z\left(9x^4-66x^2y^2+4x^2z^2-12y^4+46y^2z^2-5z^4\right)}{132}$$

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

** symmetry

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

** expression

$$-\frac{\sqrt{15}G_ux}{10}+\frac{3\sqrt{5}G_vx}{10}-\frac{\sqrt{5}G_{xy}y}{5}-\frac{\sqrt{5}G_{xz}z}{5}$$

$\tilde{\mathbb{G}}_3^{(2,-2)}[g](B, 2)$

** symmetry

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

** expression

$$\frac{\sqrt{15}G_uz}{5}-\frac{\sqrt{5}G_{xz}x}{5}-\frac{\sqrt{5}G_{yz}y}{5}$$

$\tilde{\mathbb{G}}_3^{(2,-2)}[g](B, 3)$

** symmetry

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

** expression

$$-\frac{G_ux}{2}-\frac{\sqrt{3}G_vx}{6}+\frac{\sqrt{3}G_{xy}y}{3}-\frac{\sqrt{3}G_{xz}z}{3}$$

$\tilde{\mathbb{G}}_3^{(2,-2)}[g](B, 4)$

** symmetry

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

** expression

$$\frac{\sqrt{3}G_vz}{3}+\frac{\sqrt{3}G_{xz}x}{3}-\frac{\sqrt{3}G_{yz}y}{3}$$

$\tilde{\mathbb{G}}_3^{(2,0)}[g](B, 1)$

** symmetry

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

** expression

$$-\frac{\sqrt{15}G_ux\left(4x^2-21y^2+9z^2\right)}{60}+\frac{\sqrt{5}G_vx\left(4x^2-y^2-11z^2\right)}{20}+\frac{\sqrt{5}G_{xy}y\left(4x^2-y^2-z^2\right)}{20}+\frac{\sqrt{5}G_{xz}z\left(4x^2-y^2-z^2\right)}{20}-\sqrt{5}G_{yz}xyz$$

$\tilde{\mathbb{G}}_3^{(2,0)}[g](B, 2)$

** symmetry

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

** expression

$$-\frac{\sqrt{15}G_uz(3x^2+3y^2-2z^2)}{15}-\frac{\sqrt{5}G_vz(x-y)(x+y)}{2}-\sqrt{5}G_{xy}xyz-\frac{\sqrt{5}G_{xz}x(x^2+y^2-4z^2)}{20}-\frac{\sqrt{5}G_{yz}y(x^2+y^2-4z^2)}{20}$$

$\vec{\mathbb{G}}_3^{(2,0)}[g](B, 3)$

** symmetry

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

** expression

$$\frac{G_ux(2x^2-3y^2-3z^2)}{4}+\frac{\sqrt{3}G_vx(2x^2-3y^2-3z^2)}{12}+\frac{\sqrt{3}G_{xy}y(6x^2+y^2-9z^2)}{12}-\frac{\sqrt{3}G_{xz}z(6x^2-9y^2+z^2)}{12}$$

$\vec{\mathbb{G}}_3^{(2,0)}[g](B, 4)$

** symmetry

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

** expression

$$\frac{\sqrt{3}G_vz(3x^2+3y^2-2z^2)}{6}+\frac{\sqrt{3}G_{xz}x(x^2-9y^2+6z^2)}{12}+\frac{\sqrt{3}G_{yz}y(9x^2-y^2-6z^2)}{12}$$

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

** symmetry

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

** expression

$$-\frac{\sqrt{330}G_ux(4x^4+x^2y^2-41x^2z^2-3y^4+15y^2z^2+18z^4)}{264}+\frac{\sqrt{110}G_vx(4x^4-27x^2y^2-13x^2z^2+11y^4+15y^2z^2+4z^4)}{88} \\ +\frac{\sqrt{110}G_{xy}y(8x^4-12x^2y^2-12x^2z^2+y^4+2y^2z^2+z^4)}{44}+\frac{\sqrt{110}G_{xz}z(8x^4-12x^2y^2-12x^2z^2+y^4+2y^2z^2+z^4)}{44}+\frac{7\sqrt{110}G_{yz}xyz(2x^2-y^2-z^2)}{44}$$

$\vec{\mathbb{G}}_3^{(2,2)}[g](B, 2)$

** symmetry

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

** expression

$$\frac{\sqrt{330}G_uz(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4)}{264}-\frac{7\sqrt{110}G_vz(x-y)(x+y)(x^2+y^2-2z^2)}{88}-\frac{7\sqrt{110}G_{xy}xyz(x^2+y^2-2z^2)}{44} \\ +\frac{\sqrt{110}G_{xz}x(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{44}+\frac{\sqrt{110}G_{yz}y(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{44}$$

$\vec{\mathbb{G}}_3^{(2,2)}[g](B, 3)$

** symmetry

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

** expression

$$-\frac{\sqrt{22}G_ux(2x^4+11x^2y^2-31x^2z^2+9y^4-87y^2z^2+30z^4)}{88}-\frac{\sqrt{66}G_vx(2x^4-73x^2y^2+53x^2z^2+51y^4-87y^2z^2-12z^4)}{264} \\ -\frac{\sqrt{66}G_{xy}y(12x^4-46x^2y^2+66x^2z^2+5y^4-4y^2z^2-9z^4)}{132} \\ +\frac{\sqrt{66}G_{xz}z(12x^4+66x^2y^2-46x^2z^2-9y^4-4y^2z^2+5z^4)}{132}+\frac{21\sqrt{66}G_{yz}xyz(y-z)(y+z)}{44}$$

$\vec{\mathbb{G}}_3^{(2,2)}[g](B, 4)$

** symmetry

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

** expression

$$-\frac{21\sqrt{22}G_uz(x-y)(x+y)(x^2+y^2-2z^2)}{88}+\frac{\sqrt{66}G_vz(39x^4-174x^2y^2-20x^2z^2+39y^4-20y^2z^2+4z^4)}{264}+\frac{21\sqrt{66}G_{xy}xyz(x-y)(x+y)}{44} \\ -\frac{\sqrt{66}G_{xz}x(5x^4-4x^2y^2-46x^2z^2-9y^4+66y^2z^2+12z^4)}{132}-\frac{\sqrt{66}G_{yz}y(9x^4+4x^2y^2-66x^2z^2-5y^4+46y^2z^2-12z^4)}{132}$$

* Harmonics for rank 4

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

** symmetry

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

** expression

$$-\frac{\sqrt{30}G_u(x^2 + y^2 - 2z^2)}{20} + \frac{3\sqrt{10}G_v(x - y)(x + y)}{20} - \frac{\sqrt{10}G_{xy}xy}{5} - \frac{\sqrt{10}G_{xz}xz}{5} - \frac{\sqrt{10}G_{yz}yz}{5}$$

$$\vec{\mathbb{G}}_4^{(2,-2)}[g](A, 2)$$

** symmetry

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

** expression

$$-\frac{\sqrt{42}G_u(x^2 + y^2 - 2z^2)}{28} - \frac{3\sqrt{14}G_v(x - y)(x + y)}{28} + \frac{2\sqrt{14}G_{xy}xy}{7} - \frac{\sqrt{14}G_{xz}xz}{7} - \frac{\sqrt{14}G_{yz}yz}{7}$$

$$\vec{\mathbb{G}}_4^{(2,-2)}[g](A, 3)$$

** symmetry

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

** expression

$$-\frac{3\sqrt{14}G_u(x - y)(x + y)}{28} + \frac{\sqrt{42}G_v(x^2 + y^2 - 2z^2)}{28} - \frac{\sqrt{42}G_{xz}xz}{7} + \frac{\sqrt{42}G_{yz}yz}{7}$$

$$\vec{\mathbb{G}}_4^{(2,-2)}[g](A, 4)$$

** symmetry

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

** expression

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

$$\vec{\mathbb{G}}_4^{(2,-2)}[g](A, 5)$$

** symmetry

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

** expression

$$-\frac{3\sqrt{14}G_uxz}{28} - \frac{3\sqrt{42}G_vxz}{28} + \frac{\sqrt{42}G_{xy}yz}{7} - \frac{\sqrt{42}G_{xz}(x^2 - 2y^2 + z^2)}{28} + \frac{\sqrt{42}G_{yz}xy}{7}$$

$$\vec{\mathbb{G}}_4^{(2,0)}[g](A, 1)$$

** symmetry

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

** expression

$$-\frac{\sqrt{165}G_u(x^4 - 12x^2y^2 + 6x^2z^2 + y^4 + 6y^2z^2 - 2z^4)}{66} + \frac{\sqrt{55}G_v(x - y)(x + y)(x^2 + y^2 - 6z^2)}{22} \\ + \frac{\sqrt{55}G_{xy}xy(x^2 + y^2 - 6z^2)}{22} + \frac{\sqrt{55}G_{xz}xz(x^2 - 6y^2 + z^2)}{22} - \frac{\sqrt{55}G_{yz}yz(6x^2 - y^2 - z^2)}{22}$$

$$\vec{\mathbb{G}}_4^{(2,0)}[g](A, 2)$$

** symmetry

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

** expression

$$\frac{\sqrt{231}G_u(8x^4 - 33x^2y^2 - 15x^2z^2 + 8y^4 - 15y^2z^2 + 5z^4)}{231} + \frac{\sqrt{77}G_v(x - y)(x + y)(x^2 + y^2 - 6z^2)}{77} \\ + \frac{\sqrt{77}G_{xy}xy(x^2 + y^2 - 6z^2)}{14} - \frac{\sqrt{77}G_{xz}xz(16x^2 - 33y^2 - 5z^2)}{154} + \frac{\sqrt{77}G_{yz}yz(33x^2 - 16y^2 + 5z^2)}{154}$$

$$\vec{\mathbb{G}}_4^{(2,0)}[g](A, 3)$$

** symmetry

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

** expression

$$\begin{aligned} & \frac{\sqrt{77} G_u (x - y) (x + y) (x^2 + y^2 - 6z^2)}{77} + \frac{\sqrt{231} G_v (2x^4 - 3x^2y^2 - 9x^2z^2 + 2y^4 - 9y^2z^2 + 3z^4)}{77} \\ & + \frac{\sqrt{231} G_{xy} xy (x - y) (x + y)}{22} - \frac{\sqrt{231} G_{xz} xz (2x^2 - 33y^2 + 9z^2)}{154} - \frac{\sqrt{231} G_{yz} yz (33x^2 - 2y^2 - 9z^2)}{154} \end{aligned}$$

$$\vec{\mathbb{G}}_4^{(2,0)}[g](A, 4)$$

** symmetry

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

** expression

$$\begin{aligned} & -\frac{\sqrt{11} G_u xz (11x^2 + 18y^2 - 17z^2)}{44} - \frac{\sqrt{33} G_v xz (15x^2 - 6y^2 - 13z^2)}{44} - \frac{7\sqrt{33} G_{xy} yz (3x^2 - z^2)}{44} \\ & - \frac{\sqrt{33} G_{xz} (x - z) (x + z) (x^2 - 6y^2 + z^2)}{44} - \frac{7\sqrt{33} G_{yz} xy (x^2 - 3z^2)}{44} \end{aligned}$$

$$\vec{\mathbb{G}}_4^{(2,0)}[g](A, 5)$$

** symmetry

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

** expression

$$\begin{aligned} & \frac{\sqrt{77} G_u xz (25x^2 - 24y^2 - 17z^2)}{308} - \frac{\sqrt{231} G_v xz (3x^2 + 24y^2 - 11z^2)}{308} + \frac{\sqrt{231} G_{xy} yz (39x^2 + 18y^2 - 31z^2)}{308} \\ & - \frac{\sqrt{231} G_{xz} (x^4 - 36x^2y^2 + 30x^2z^2 + 12y^4 - 36y^2z^2 + z^4)}{308} - \frac{\sqrt{231} G_{yz} xy (31x^2 - 18y^2 - 39z^2)}{308} \end{aligned}$$

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

** symmetry

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

** expression

$$\begin{aligned} & -\frac{\sqrt{15015} G_u (x^6 - 15x^4z^2 + 15x^2z^4 + y^6 - 15y^4z^2 + 15y^2z^4 - 2z^6)}{572} \\ & + \frac{3\sqrt{5005} G_v (x - y) (x + y) (x^4 - 9x^2y^2 - 5x^2z^2 + y^4 - 5y^2z^2 + 5z^4)}{572} + \frac{\sqrt{5005} G_{xy} xy (7x^4 - 19x^2y^2 - 13x^2z^2 + 7y^4 - 13y^2z^2 + 13z^4)}{286} \\ & + \frac{\sqrt{5005} G_{xz} xz (7x^4 - 13x^2y^2 - 19x^2z^2 + 13y^4 - 13y^2z^2 + 7z^4)}{286} + \frac{\sqrt{5005} G_{yz} yz (13x^4 - 13x^2y^2 - 13x^2z^2 + 7y^4 - 19y^2z^2 + 7z^4)}{286} \end{aligned}$$

$$\vec{\mathbb{G}}_4^{(2,2)}[g](A, 2)$$

** symmetry

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

** expression

$$\begin{aligned} & -\frac{\sqrt{429} G_u (x^6 + 45x^4y^2 - 60x^4z^2 + 45x^2y^4 - 540x^2y^2z^2 + 150x^2z^4 + y^6 - 60y^4z^2 + 150y^2z^4 - 20z^6)}{1144} \\ & - \frac{21\sqrt{143} G_v (x - y) (x + y) (x^4 - 20x^2y^2 + 6x^2z^2 + y^4 + 6y^2z^2 - 6z^4)}{1144} - \frac{7\sqrt{143} G_{xy} xy (x^4 - 4x^2y^2 + 2x^2z^2 + y^4 + 2y^2z^2 - 2z^4)}{52} \\ & + \frac{7\sqrt{143} G_{xz} xz (x^4 + 56x^2y^2 - 22x^2z^2 - 11y^4 - 34y^2z^2 + 10z^4)}{572} - \frac{7\sqrt{143} G_{yz} yz (11x^4 - 56x^2y^2 + 34x^2z^2 - y^4 + 22y^2z^2 - 10z^4)}{572} \end{aligned}$$

$$\vec{\mathbb{G}}_4^{(2,2)}[g](A, 3)$$

** symmetry

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

** expression

$$\begin{aligned}
& -\frac{21\sqrt{143}G_u(x-y)(x+y)(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{1144} \\
& + \frac{\sqrt{429}G_v(13x^6-45x^4y^2-150x^4z^2-45x^2y^4+540x^2y^2z^2+60x^2z^4+13y^6-150y^4z^2+60y^2z^4-8z^6)}{1144} \\
& + \frac{21\sqrt{429}G_{xy}xy(x-y)(x+y)(x^2+y^2-10z^2)}{572} + \frac{7\sqrt{429}G_{xz}xz(7x^4-4x^2y^2-22x^2z^2-11y^4+26y^2z^2+4z^4)}{572} \\
& + \frac{7\sqrt{429}G_{yz}yz(11x^4+4x^2y^2-26x^2z^2-7y^4+22y^2z^2-4z^4)}{572}
\end{aligned}$$

$\vec{\mathbb{G}}_4^{(2,2)}[g](A, 4)$

** symmetry

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

** expression

$$\begin{aligned}
& 3\sqrt{1001}G_uxz(11x^4+13x^2y^2-41x^2z^2+2y^4-17y^2z^2+14z^4) \\
& -\frac{572}{\sqrt{3003}G_vxz(17x^4-47x^2y^2-41x^2z^2+2y^4+43y^2z^2+8z^4)} - \frac{3\sqrt{3003}G_{xy}yz(8x^4-3x^2y^2-13x^2z^2+y^2z^2+z^4)}{286} \\
& + \frac{\sqrt{3003}G_{xz}(x-z)(x+z)(2x^4+x^2y^2-29x^2z^2-y^4+y^2z^2+2z^4)}{286} + \frac{3\sqrt{3003}G_{yz}xy(x^4+x^2y^2-13x^2z^2-3y^2z^2+8z^4)}{286}
\end{aligned}$$

$\vec{\mathbb{G}}_4^{(2,2)}[g](A, 5)$

** symmetry

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

** expression

$$\begin{aligned}
& 21\sqrt{143}G_uxz(x^4-7x^2y^2-x^2z^2-8y^4+23y^2z^2-2z^4) - \frac{21\sqrt{429}G_vxz(x^4-13x^2y^2+x^2z^2+8y^4-3y^2z^2)}{572} \\
& - \frac{7\sqrt{429}G_{xy}yz(8x^4-23x^2y^2+7x^2z^2+2y^4+y^2z^2-z^4)}{286} \\
& + \frac{\sqrt{429}G_{xz}(2x^6-15x^4y^2-15x^4z^2-15x^2y^4+180x^2y^2z^2-15x^2z^4+2y^6-15y^4z^2-15y^2z^4+2z^6)}{286} \\
& + \frac{7\sqrt{429}G_{yz}xy(x^4-x^2y^2-7x^2z^2-2y^4+23y^2z^2-8z^4)}{286}
\end{aligned}$$

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

** symmetry

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

** expression

$$-\frac{3\sqrt{2}G_uyz}{4} - \frac{\sqrt{6}G_vyz}{4} + \frac{\sqrt{6}G_{yz}(y-z)(y+z)}{4}$$

$\vec{\mathbb{G}}_4^{(2,-2)}[g](B, 2)$

** symmetry

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

** expression

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

$\vec{\mathbb{G}}_4^{(2,-2)}[g](B, 3)$

** symmetry

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

** expression

$$-\frac{3\sqrt{14}G_uyz}{28} + \frac{3\sqrt{42}G_vyz}{28} + \frac{\sqrt{42}G_{xy}xz}{7} + \frac{\sqrt{42}G_{xz}xy}{7} + \frac{\sqrt{42}G_{yz}(2x^2-y^2-z^2)}{28}$$

$\vec{\mathbb{G}}_4^{(2,-2)}[g](B, 4)$

** symmetry

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

** expression

$$\frac{3\sqrt{14}G_{u}xy}{14} - \frac{\sqrt{42}G_{xy}(x^2 + y^2 - 2z^2)}{28} + \frac{\sqrt{42}G_{xz}yz}{7} + \frac{\sqrt{42}G_{yz}xz}{7}$$

$\vec{\mathbb{G}}_4^{(2,0)}[g](B, 1)$

** symmetry

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

** expression

$$\begin{aligned} & \frac{\sqrt{11}G_{u}yz(18x^2 + 11y^2 - 17z^2)}{44} + \frac{\sqrt{33}G_{v}yz(6x^2 - 15y^2 + 13z^2)}{44} + \frac{7\sqrt{33}G_{xy}xz(3y^2 - z^2)}{44} \\ & + \frac{7\sqrt{33}G_{xz}xy(y^2 - 3z^2)}{44} - \frac{\sqrt{33}G_{yz}(y - z)(y + z)(6x^2 - y^2 - z^2)}{44} \end{aligned}$$

$\vec{\mathbb{G}}_4^{(2,0)}[g](B, 2)$

** symmetry

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

** expression

$$\begin{aligned} & -\frac{7\sqrt{11}G_{u}xy(x - y)(x + y)}{11} + \frac{\sqrt{33}G_{v}xy(x^2 + y^2 - 6z^2)}{22} \\ & + \frac{\sqrt{33}G_{xy}(x - y)(x + y)(x^2 + y^2 - 6z^2)}{44} + \frac{7\sqrt{33}G_{xz}yz(3x^2 - y^2)}{44} + \frac{7\sqrt{33}G_{yz}xz(x^2 - 3y^2)}{44} \end{aligned}$$

$\vec{\mathbb{G}}_4^{(2,0)}[g](B, 3)$

** symmetry

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

** expression

$$\begin{aligned} & -\frac{\sqrt{77}G_{u}yz(24x^2 - 25y^2 + 17z^2)}{308} + \frac{\sqrt{231}G_{v}yz(24x^2 + 3y^2 - 11z^2)}{308} + \frac{\sqrt{231}G_{xy}xz(18x^2 + 39y^2 - 31z^2)}{308} \\ & + \frac{\sqrt{231}G_{xz}xy(18x^2 - 31y^2 + 39z^2)}{308} - \frac{\sqrt{231}G_{yz}(12x^4 - 36x^2y^2 - 36x^2z^2 + y^4 + 30y^2z^2 + z^4)}{308} \end{aligned}$$

$\vec{\mathbb{G}}_4^{(2,0)}[g](B, 4)$

** symmetry

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

** expression

$$\begin{aligned} & -\frac{2\sqrt{77}G_{u}xy(x^2 + y^2 - 6z^2)}{77} - \frac{\sqrt{231}G_{v}xy(x - y)(x + y)}{22} - \frac{\sqrt{231}G_{xy}(x^4 + 30x^2y^2 - 36x^2z^2 + y^4 - 36y^2z^2 + 12z^4)}{308} \\ & + \frac{\sqrt{231}G_{xz}yz(39x^2 - 31y^2 + 18z^2)}{308} - \frac{\sqrt{231}G_{yz}xz(31x^2 - 39y^2 - 18z^2)}{308} \end{aligned}$$

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

** symmetry

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

** expression

$$\begin{aligned} & -\frac{3\sqrt{1001}G_{u}yz(2x^4 + 13x^2y^2 - 17x^2z^2 + 11y^4 - 41y^2z^2 + 14z^4)}{572} - \frac{\sqrt{3003}G_{v}yz(2x^4 - 47x^2y^2 + 43x^2z^2 + 17y^4 - 41y^2z^2 + 8z^4)}{572} \\ & - \frac{3\sqrt{3003}G_{xy}xz(3x^2y^2 - x^2z^2 - 8y^4 + 13y^2z^2 - z^4)}{286} - \frac{3\sqrt{3003}G_{xz}xy(x^2y^2 - 3x^2z^2 + y^4 - 13y^2z^2 + 8z^4)}{286} \\ & + \frac{\sqrt{3003}G_{yz}(y - z)(y + z)(x^4 - x^2y^2 - x^2z^2 - 2y^4 + 29y^2z^2 - 2z^4)}{286} \end{aligned}$$

$\vec{\mathbb{G}}_4^{(2,2)}[g](B, 2)$

** symmetry

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

** expression

$$\begin{aligned} & -\frac{9\sqrt{1001}G_uxy(x-y)(x+y)(x^2+y^2-10z^2)}{572} + \frac{\sqrt{3003}G_vxy(25x^4-82x^2y^2-4x^2z^2+25y^4-4y^2z^2+4z^4)}{572} \\ & -\frac{\sqrt{3003}G_{xy}(x-y)(x+y)(2x^4-29x^2y^2+x^2z^2+2y^4+y^2z^2-z^4)}{286} \\ & +\frac{3\sqrt{3003}G_{xz}yz(8x^4-13x^2y^2-3x^2z^2+y^4+y^2z^2)}{286} -\frac{3\sqrt{3003}G_{yz}xz(x^4-13x^2y^2+x^2z^2+8y^4-3y^2z^2)}{286} \end{aligned}$$

$\vec{\mathbb{G}}_4^{(2,2)}[g](B, 3)$

** symmetry

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

** expression

$$\begin{aligned} & -\frac{21\sqrt{143}G_uyz(8x^4+7x^2y^2-23x^2z^2-y^4+y^2z^2+2z^4)}{572} + \frac{21\sqrt{429}G_vyz(8x^4-13x^2y^2-3x^2z^2+y^4+y^2z^2)}{572} \\ & -\frac{7\sqrt{429}G_{xy}xz(2x^4-23x^2y^2+x^2z^2+8y^4+7y^2z^2-z^4)}{286} -\frac{7\sqrt{429}G_{xz}xy(2x^4+x^2y^2-23x^2z^2-y^4+7y^2z^2+8z^4)}{286} \\ & +\frac{\sqrt{429}G_{yz}(2x^6-15x^4y^2-15x^4z^2-15x^2y^4+180x^2y^2z^2-15x^2z^4+2y^6-15y^4z^2-15y^2z^4+2z^6)}{286} \end{aligned}$$

$\vec{\mathbb{G}}_4^{(2,2)}[g](B, 4)$

** symmetry

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

** expression

$$\begin{aligned} & -\frac{21\sqrt{143}G_uxy(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4)}{572} -\frac{21\sqrt{429}G_vxy(x-y)(x+y)(x^2+y^2-10z^2)}{572} \\ & +\frac{\sqrt{429}G_{xy}(2x^6-15x^4y^2-15x^4z^2-15x^2y^4+180x^2y^2z^2-15x^2z^4+2y^6-15y^4z^2-15y^2z^4+2z^6)}{286} \\ & -\frac{7\sqrt{429}G_{xz}yz(8x^4+7x^2y^2-23x^2z^2-y^4+y^2z^2+2z^4)}{286} +\frac{7\sqrt{429}G_{yz}xz(x^4-7x^2y^2-x^2z^2-8y^4+23y^2z^2-2z^4)}{286} \end{aligned}$$