

PG No. 31 T_d $\bar{4}3m$ [cubic] (polar, internal axial quadrupole)

* Harmonics for rank 0

* Harmonics for rank 1

$$\tilde{Q}_{1,1}^{(2,1)}[g](T_2), \tilde{Q}_{1,2}^{(2,1)}[g](T_2), \tilde{Q}_{1,3}^{(2,1)}[g](T_2)$$

** symmetry

$$x$$

$$y$$

$$z$$

** expression

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

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

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

* Harmonics for rank 2

$$\tilde{Q}_{2,1}^{(2,-1)}[g](E), \tilde{Q}_{2,2}^{(2,-1)}[g](E)$$

** symmetry

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

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

** expression

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

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

$$\tilde{Q}_{2,1}^{(2,1)}[g](E), \tilde{Q}_{2,2}^{(2,1)}[g](E)$$

** symmetry

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

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

** expression

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

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

$$\tilde{Q}_{2,1}^{(2,-1)}[g](T_2), \tilde{Q}_{2,2}^{(2,-1)}[g](T_2), \tilde{Q}_{2,3}^{(2,-1)}[g](T_2)$$

** symmetry

$$\sqrt{3} y z$$

$$\sqrt{3} x z$$

$$\sqrt{3} x y$$

** expression

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

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

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

$$\tilde{\mathbb{Q}}_{2,1}^{(2,1)}[g](T_2), \tilde{\mathbb{Q}}_{2,2}^{(2,1)}[g](T_2), \tilde{\mathbb{Q}}_{2,3}^{(2,1)}[g](T_2)$$

** symmetry

$$\sqrt{3}yz$$

$$\sqrt{3}xz$$

$$\sqrt{3}xy$$

** expression

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

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

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

* Harmonics for rank 3

$$\tilde{\mathbb{Q}}_3^{(2,-1)}[g](A_1)$$

** symmetry

$$\sqrt{15}xyz$$

** expression

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

$$\tilde{\mathbb{Q}}_3^{(2,1)}[g](A_1)$$

** symmetry

$$\sqrt{15}xyz$$

** expression

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

$$\tilde{\mathbb{Q}}_{3,1}^{(2,-1)}[g](T_1), \tilde{\mathbb{Q}}_{3,2}^{(2,-1)}[g](T_1), \tilde{\mathbb{Q}}_{3,3}^{(2,-1)}[g](T_1)$$

** symmetry

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

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

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

** expression

$$\frac{\sqrt{6}G_u yz}{4} - \frac{3\sqrt{2}G_v yz}{4} + \frac{\sqrt{2}G_{yz} (2x^2 - y^2 - z^2)}{4}$$

$$\frac{\sqrt{6}G_u xz}{4} + \frac{3\sqrt{2}G_v xz}{4} - \frac{\sqrt{2}G_{xz} (x^2 - 2y^2 + z^2)}{4}$$

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

$$\tilde{\mathbb{Q}}_{3,1}^{(2,1)}[g](T_1), \tilde{\mathbb{Q}}_{3,2}^{(2,1)}[g](T_1), \tilde{\mathbb{Q}}_{3,3}^{(2,1)}[g](T_1)$$

** symmetry

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

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

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

** expression

$$\frac{\sqrt{3}G_u y z (12x^2 - 9y^2 + 5z^2)}{12} - \frac{G_v y z (36x^2 + y^2 - 13z^2)}{12} + \frac{7G_{xy} x z (2x^2 - 3y^2 - z^2)}{12}$$

$$+ \frac{7G_{xz} x y (2x^2 - y^2 - 3z^2)}{12} - \frac{G_{yz} (4x^4 - 12x^2 y^2 - 12x^2 z^2 + 5y^4 - 18y^2 z^2 + 5z^4)}{12}$$

$$-\frac{\sqrt{3}G_u x z (9x^2 - 12y^2 - 5z^2)}{12} + \frac{G_v x z (x^2 + 36y^2 - 13z^2)}{12} - \frac{7G_{xy} y z (3x^2 - 2y^2 + z^2)}{12}$$

$$-\frac{G_{xz} (5x^4 - 12x^2 y^2 - 18x^2 z^2 + 4y^4 - 12y^2 z^2 + 5z^4)}{12} - \frac{7G_{yz} x y (x^2 - 2y^2 + 3z^2)}{12}$$

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

$$-\frac{7G_{xz} y z (3x^2 + y^2 - 2z^2)}{12} - \frac{7G_{yz} x z (x^2 + 3y^2 - 2z^2)}{12}$$

$$\tilde{\mathbb{Q}}_{3,1}^{(2,-1)}[g](T_2), \tilde{\mathbb{Q}}_{3,2}^{(2,-1)}[g](T_2), \tilde{\mathbb{Q}}_{3,3}^{(2,-1)}[g](T_2)$$

** symmetry

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

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

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

** expression

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

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

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

$$\tilde{\mathbb{Q}}_{3,1}^{(2,1)}[g](T_2), \tilde{\mathbb{Q}}_{3,2}^{(2,1)}[g](T_2), \tilde{\mathbb{Q}}_{3,3}^{(2,1)}[g](T_2)$$

** symmetry

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

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

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

** expression

$$-\frac{\sqrt{5}G_u y z (6x^2 - y^2 - z^2)}{4} - \frac{\sqrt{15}G_v y z (6x^2 - y^2 - z^2)}{12} + \frac{\sqrt{15}G_{xy} x z (4x^2 - 3y^2 - 3z^2)}{12}$$

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

$$-\frac{\sqrt{5}G_u x z (x^2 - 6y^2 + z^2)}{4} + \frac{\sqrt{15}G_v x z (x^2 - 6y^2 + z^2)}{12} + \frac{\sqrt{15}G_{xy} y z (3x^2 - 4y^2 + 3z^2)}{12}$$

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

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

* Harmonics for rank 4

$$\tilde{\mathbb{Q}}_4^{(2,-1)}[g](A_1)$$

** symmetry

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

** expression

$$\frac{\sqrt{5}G_{xyz}(x-y)(x+y)}{2} - \frac{\sqrt{5}G_{xzy}(x-z)(x+z)}{2} + \frac{\sqrt{5}G_{yzx}(y-z)(y+z)}{2}$$

$$\tilde{\mathbb{Q}}_4^{(2,1)}[g](A_1)$$

** symmetry

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

** expression

$$\begin{aligned} & -\frac{3\sqrt{2310}G_{uxyz}(x-y)(x+y)}{44} - \frac{3\sqrt{770}G_vxyz(x^2+y^2-2z^2)}{44} + \frac{\sqrt{770}G_{xyz}(x-y)(x+y)(x^2+y^2-2z^2)}{22} \\ & - \frac{\sqrt{770}G_{xzy}(x-z)(x+z)(x^2-2y^2+z^2)}{22} - \frac{\sqrt{770}G_{yzx}(y-z)(y+z)(2x^2-y^2-z^2)}{22} \end{aligned}$$

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

** symmetry

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

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

** expression

$$-\frac{6\sqrt{7}G_vxyz}{7} - \frac{\sqrt{7}G_{xyz}(x-y)(x+y)}{14} + \frac{\sqrt{7}G_{xzy}(4x^2-3y^2+5z^2)}{14} + \frac{\sqrt{7}G_{yzx}(3x^2-4y^2-5z^2)}{14}$$

$$\frac{6\sqrt{7}G_{uxyz}}{7} + \frac{\sqrt{21}G_{xyz}(3x^2+3y^2-2z^2)}{14} - \frac{\sqrt{21}G_{xzy}(2x^2-y^2+z^2)}{14} + \frac{\sqrt{21}G_{yzx}(x^2-2y^2-z^2)}{14}$$

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

** symmetry

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

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

** expression

$$\begin{aligned} & \frac{21\sqrt{66}G_{uxyz}(x-y)(x+y)}{44} - \frac{21\sqrt{22}G_vxyz(x^2+y^2-2z^2)}{44} + \frac{7\sqrt{22}G_{xyz}(x-y)(x+y)(x^2+y^2-2z^2)}{44} \\ & + \frac{\sqrt{22}G_{xzy}(17x^4-22x^2y^2-36x^2z^2+3y^4-8y^2z^2+10z^4)}{44} - \frac{\sqrt{22}G_{yzx}(3x^4-22x^2y^2-8x^2z^2+17y^4-36y^2z^2+10z^4)}{44} \\ & - \frac{21\sqrt{22}G_{uxyz}(x^2+y^2-2z^2)}{44} - \frac{21\sqrt{66}G_vxyz(x-y)(x+y)}{44} + \frac{\sqrt{66}G_{xyz}(9x^4-24x^2y^2-10x^2z^2+9y^4-10y^2z^2+2z^4)}{44} \\ & - \frac{\sqrt{66}G_{xzy}(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{44} - \frac{\sqrt{66}G_{yzx}(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{44} \end{aligned}$$

$$\tilde{\mathbb{Q}}_{4,1}^{(2,-1)}[g](T_1), \tilde{\mathbb{Q}}_{4,2}^{(2,-1)}[g](T_1), \tilde{\mathbb{Q}}_{4,3}^{(2,-1)}[g](T_1)$$

** symmetry

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

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

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

** expression

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

$$\tilde{\mathbb{Q}}_{4,1}^{(2,1)}[g](T_1), \tilde{\mathbb{Q}}_{4,2}^{(2,1)}[g](T_1), \tilde{\mathbb{Q}}_{4,3}^{(2,1)}[g](T_1)$$

** symmetry

$$\begin{aligned} & \frac{\sqrt{35} y z (y-z)(y+z)}{2} \\ & - \frac{\sqrt{35} x z (x-z)(x+z)}{2} \\ & \frac{\sqrt{35} x y (x-y)(x+y)}{2} \end{aligned}$$

** expression

$$\begin{aligned} & - \frac{3\sqrt{154}G_u x (x^2 y^2 - x^2 z^2 + y^4 - 9y^2 z^2 + 2z^4)}{88} - \frac{\sqrt{462}G_v x (x^2 y^2 - x^2 z^2 - 5y^4 + 27y^2 z^2 - 4z^4)}{88} \\ & - \frac{\sqrt{462}G_{xy} y (2x^2 y^2 - 6x^2 z^2 - y^4 + 8y^2 z^2 - 3z^4)}{44} + \frac{\sqrt{462}G_{xz} z (6x^2 y^2 - 2x^2 z^2 + 3y^4 - 8y^2 z^2 + z^4)}{44} - \frac{\sqrt{462}G_{yz} x y z (2x^2 - y^2 - z^2)}{44} \\ & - \frac{3\sqrt{154}G_u y (x^4 + x^2 y^2 - 9x^2 z^2 - y^2 z^2 + 2z^4)}{88} - \frac{\sqrt{462}G_v y (5x^4 - x^2 y^2 - 27x^2 z^2 + y^2 z^2 + 4z^4)}{88} \\ & + \frac{\sqrt{462}G_{xy} x (x^4 - 2x^2 y^2 - 8x^2 z^2 + 6y^2 z^2 + 3z^4)}{44} + \frac{\sqrt{462}G_{xz} x y z (x^2 - 2y^2 + z^2)}{44} + \frac{\sqrt{462}G_{yz} z (3x^4 + 6x^2 y^2 - 8x^2 z^2 - 2y^2 z^2 + z^4)}{44} \\ & \frac{9\sqrt{154}G_u z (x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{88} - \frac{\sqrt{462}G_v z (x-y)(x+y)(x^2 + y^2 - 2z^2)}{88} + \frac{\sqrt{462}G_{xy} x y z (x^2 + y^2 - 2z^2)}{44} \\ & + \frac{\sqrt{462}G_{xz} x (x^4 - 8x^2 y^2 - 2x^2 z^2 + 3y^4 + 6y^2 z^2)}{44} + \frac{\sqrt{462}G_{yz} y (3x^4 - 8x^2 y^2 + 6x^2 z^2 + y^4 - 2y^2 z^2)}{44} \end{aligned}$$

$$\tilde{\mathbb{Q}}_{4,1}^{(2,-1)}[g](T_2), \tilde{\mathbb{Q}}_{4,2}^{(2,-1)}[g](T_2), \tilde{\mathbb{Q}}_{4,3}^{(2,-1)}[g](T_2)$$

** symmetry

$$\begin{aligned} & \frac{\sqrt{5} y z (6x^2 - y^2 - z^2)}{2} \\ & - \frac{\sqrt{5} x z (x^2 - 6y^2 + z^2)}{2} \\ & - \frac{\sqrt{5} x y (x^2 + y^2 - 6z^2)}{2} \end{aligned}$$

** expression

$$\begin{aligned} & \frac{3\sqrt{7}G_u x (2x^2 - 5y^2 - z^2)}{28} + \frac{\sqrt{21}G_v x (2x^2 + 3y^2 - 9z^2)}{28} - \frac{\sqrt{21}G_{xy} y (2x^2 + y^2 - 5z^2)}{28} + \frac{\sqrt{21}G_{xz} z (2x^2 - 5y^2 + z^2)}{28} \\ & \frac{3\sqrt{7}G_u y (5x^2 - 2y^2 + z^2)}{28} + \frac{\sqrt{21}G_v y (3x^2 + 2y^2 - 9z^2)}{28} + \frac{\sqrt{21}G_{xy} x (x^2 + 2y^2 - 5z^2)}{28} + \frac{\sqrt{21}G_{yz} z (5x^2 - 2y^2 - z^2)}{28} \\ & \frac{3\sqrt{7}G_u z (x-y)(x+y)}{7} + \frac{\sqrt{21}G_v z (3x^2 + 3y^2 - 2z^2)}{14} - \frac{\sqrt{21}G_{xz} x (x^2 - 5y^2 + 2z^2)}{28} - \frac{\sqrt{21}G_{yz} y (5x^2 - y^2 - 2z^2)}{28} \end{aligned}$$

$$\tilde{\mathbb{Q}}_{4,1}^{(2,1)}[g](T_2), \tilde{\mathbb{Q}}_{4,2}^{(2,1)}[g](T_2), \tilde{\mathbb{Q}}_{4,3}^{(2,1)}[g](T_2)$$

** symmetry

$$\begin{aligned} & \frac{\sqrt{5} y z (6x^2 - y^2 - z^2)}{2} \\ & - \frac{\sqrt{5} x z (x^2 - 6y^2 + z^2)}{2} \end{aligned}$$

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

** expression

$$\begin{aligned}
& -\frac{3\sqrt{22}G_u x(2x^4-3x^2y^2-17x^2z^2-5y^4+39y^2z^2+2z^4)}{88} - \frac{\sqrt{66}G_v x(2x^4-31x^2y^2+11x^2z^2+9y^4+39y^2z^2-12z^4)}{88} \\
& - \frac{\sqrt{66}G_{xy}y(8x^4-12x^2y^2-12x^2z^2+y^4+2y^2z^2+z^4)}{44} + \frac{\sqrt{66}G_{xz}z(8x^4-12x^2y^2-12x^2z^2+y^4+2y^2z^2+z^4)}{44} - \frac{21\sqrt{66}G_{yz}xyz(y-z)(y+z)}{44} \\
& - \frac{3\sqrt{22}G_u y(5x^4+3x^2y^2-39x^2z^2-2y^4+17y^2z^2-2z^4)}{88} - \frac{\sqrt{66}G_v y(9x^4-31x^2y^2+39x^2z^2+2y^4+11y^2z^2-12z^4)}{88} \\
& + \frac{\sqrt{66}G_{xy}x(x^4-12x^2y^2+2x^2z^2+8y^4-12y^2z^2+z^4)}{44} + \frac{21\sqrt{66}G_{xz}xyz(x-z)(x+z)}{44} - \frac{\sqrt{66}G_{yz}z(x^4-12x^2y^2+2x^2z^2+8y^4-12y^2z^2+z^4)}{44} \\
& - \frac{21\sqrt{22}G_u z(x-y)(x+y)(x^2+y^2-2z^2)}{88} - \frac{\sqrt{66}G_v z(3x^4-78x^2y^2+20x^2z^2+3y^4+20y^2z^2-4z^4)}{88} - \frac{21\sqrt{66}G_{xy}xyz(x-y)(x+y)}{44} \\
& - \frac{\sqrt{66}G_{xz}x(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{44} + \frac{\sqrt{66}G_{yz}y(x^4+2x^2y^2-12x^2z^2+y^4-12y^2z^2+8z^4)}{44}
\end{aligned}$$