The (possibly singular) a-matrices associated with the Lagrangian, as defined below Eq. (18) of arXiv:1812.02675:

Matrix for spin-0 sector:

$$\begin{pmatrix}
0 & 0 & 0 & 0 & \frac{i a_{0} k}{4} & -\frac{i a_{0} k}{4\sqrt{2}} & 0 \\
0 & 0 & \frac{i a_{0} k}{2\sqrt{2}} & 0 & -\frac{i a_{0} k}{4\sqrt{3}} & \frac{i a_{0} k}{4\sqrt{6}} & 0 \\
0 & -\frac{i a_{0} k}{2\sqrt{2}} & -\frac{a_{0}}{2} & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & \frac{a_{0}}{2} & -\frac{a_{0}}{2\sqrt{2}} & 0 \\
-\frac{1}{4} i a_{0} k & \frac{i a_{0} k}{4\sqrt{3}} & 0 & \frac{a_{0}}{2} & 0 & -\frac{a_{0}}{2\sqrt{2}} & 0 \\
\frac{i a_{0} k}{4\sqrt{2}} & -\frac{i a_{0} k}{4\sqrt{6}} & 0 & -\frac{a_{0}}{2\sqrt{2}} & -\frac{a_{0}}{2\sqrt{2}} & \frac{a_{0}}{2} & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & -\frac{a_{0}}{2}
\end{pmatrix}$$

Matrix for spin-1 sector:

$$\begin{pmatrix}
\frac{1}{4}\left(-a_{0}+2 c_{8} k^2\right) & -\frac{a_{0}}{2\sqrt{2}} & \frac{c_{8} k^2}{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-\frac{a_{0}}{2\sqrt{2}} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\frac{c_{8} k^2}{2} & 0 & \frac{1}{4}\left(a_{0}+2 c_{8} k^2\right) & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & \frac{i a_{0} k}{4\sqrt{2}} & 0 & -\frac{i a_{0} k}{4\sqrt{6}} & \frac{1}{4} i \sqrt{\frac{5}{6}}\, a_{0} k & -\frac{i a_{0} k}{4\sqrt{3}} & -\frac{i a_{0} k}{4\sqrt{6}} \\
0 & 0 & 0 & -\frac{i a_{0} k}{4\sqrt{2}} & \frac{1}{4}\left(-a_{0}+2 c_{8} k^2\right) & \frac{a_{0}}{2\sqrt{2}} & \frac{c_{8} k^2}{2\sqrt{3}} & \frac{1}{2}\sqrt{\frac{5}{3}}\, c_{8} k^2 & \frac{c_{8} k^2}{\sqrt{6}} & -\frac{c_{8} k^2}{2\sqrt{3}} \\
0 & 0 & 0 & 0 & \frac{a_{0}}{2\sqrt{2}} & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & \frac{i a_{0} k}{4\sqrt{6}} & \frac{c_{8} k^2}{2\sqrt{3}} & 0 & \frac{1}{6}\left(-2 a_{0}+c_{8} k^2\right) & \frac{1}{6}\sqrt{5}\left(a_{0}+c_{8} k^2\right) & -\frac{a_{0}-2 c_{8} k^2}{6\sqrt{2}} & \frac{1}{6}\left(-a_{0}-c_{8} k^2\right) \\
0 & 0 & 0 & -\frac{1}{4} i \sqrt{\frac{5}{6}}\, a_{0} k & \frac{1}{2}\sqrt{\frac{5}{3}}\, c_{8} k^2 & 0 & \frac{1}{6}\sqrt{5}\left(a_{0}+c_{8} k^2\right) & \frac{1}{6}\left(2 a_{0}+5 c_{8} k^2\right) & -\frac{1}{6}\sqrt{\frac{5}{2}}\left(a_{0}-2 c_{8} k^2\right) & -\frac{1}{6}\sqrt{5}\left(a_{0}+c_{8} k^2\right) \\
0 & 0 & 0 & \frac{i a_{0} k}{4\sqrt{3}} & \frac{c_{8} k^2}{\sqrt{6}} & 0 & -\frac{a_{0}-2 c_{8} k^2}{6\sqrt{2}} & -\frac{1}{6}\sqrt{\frac{5}{2}}\left(a_{0}-2 c_{8} k^2\right) & \frac{1}{3}\left(a_{0}+c_{8} k^2\right) & \frac{a_{0}-2 c_{8} k^2}{6\sqrt{2}} \\
0 & 0 & 0 & \frac{i a_{0} k}{4\sqrt{6}} & -\frac{c_{8} k^2}{2\sqrt{3}} & 0 & \frac{1}{6}\left(-a_{0}-c_{8} k^2\right) & -\frac{1}{6}\sqrt{5}\left(a_{0}+c_{8} k^2\right) & \frac{a_{0}-2 c_{8} k^2}{6\sqrt{2}} & \frac{1}{12}\left(5 a_{0}+2 c_{8} k^2\right)
\end{pmatrix}$$

Matrix for spin-2 sector:

$$\begin{pmatrix}
0 & -\frac{i a_{0} k}{4\sqrt{2}} & -\frac{i a_{0} k}{4\sqrt{3}} & \frac{i a_{0} k}{4\sqrt{6}} & 0 & 0 \\
\frac{i a_{0} k}{4\sqrt{2}} & \frac{a_{0}}{4} & 0 & 0 & 0 & 0 \\
\frac{i a_{0} k}{4\sqrt{3}} & 0 & -\frac{a_{0}}{2} & 0 & 0 & 0 \\
-\frac{i a_{0} k}{4\sqrt{6}} & 0 & 0 & \frac{a_{0}}{4} & 0 & 0 \\
0 & 0 & 0 & 0 & \frac{a_{0}}{4} & 0 \\
0 & 0 & 0 & 0 & 0 & \frac{a_{0}}{4}
\end{pmatrix}$$

Matrix for spin-3 sector:

$$\begin{pmatrix} -\frac{a_{0}}{2} \end{pmatrix}$$

Gauge constraints on source currents:

$$-6 i\, {}^{0^+}\!\mathcal{T}^{\perp} + k\, {}^{0^+}\!\mathcal{Z}^{\parallel} + 2 k\, {}^{0^+}\!\mathcal{Z}^{\perp h} == 0$$

$$2 i\, {}^{0^+}\!\mathcal{T}^{\perp} + k\, {}^{0^+}\!\mathcal{Z}^{\perp t} == 0$$

$$-6 i\, {}^{1^-}\!\mathcal{T}^{\perp \alpha} + k\, {}^{1^-}\!\mathcal{Z}^{\perp h \alpha} == k\left({}^{1^-}\!\mathcal{Z}^{\perp t \alpha} + 3\, {}^{1^-}\!\mathcal{Y}^{\perp \alpha}\right)$$