$$
H_{89} = \begin{bmatrix}
-6\,\mu+2\,U & \mathbf{i}\,\sqrt{3}\,t & 0 & 0 & 0 & 0 & 0 & 0 & 0 & t & 0 & 0 & \frac{-t}{2}+\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & 0 & \frac{t}{2}+\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & 0 \\
-\mathbf{i}\,\sqrt{3}\,t & -6\,\mu+2\,U & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -\left(\sqrt{2}\,t\right) & 0 & \frac{t}{2}+\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & 0 & \frac{-3\,t}{2}+\frac{\mathbf{i}}{2}\,\sqrt{3}\,t \\
0 & 0 & -6\,\mu+2\,U & -\mathbf{i}\,\sqrt{\frac{3}{2}}\,t+\frac{t}{\sqrt{2}} & 0 & 0 & \sqrt{2}\,t & 0 & 0 & 0 & \sqrt{2}\,t & 0 & 0 & -\left(\sqrt{2}\,t\right) & 0 & 0 \\
0 & 0 & \mathbf{i}\,\sqrt{\frac{3}{2}}\,t+\frac{t}{\sqrt{2}} & -6\,\mu+2\,U & -t & -\left(\sqrt{2}\,t\right) & 0 & \frac{-t}{2}-\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & 0 & 0 & 0 & 0 & t & 0 & t & 0 \\
0 & 0 & 0 & -t & -6\,\mu+2\,U & 0 & -t & 0 & 0 & 0 & 0 & 0 & 0 & \frac{3\,t}{2}+\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & 0 & \frac{t}{2}-\frac{\mathbf{i}}{2}\,\sqrt{3}\,t \\
0 & 0 & 0 & -\left(\sqrt{2}\,t\right) & 0 & -6\,\mu+2\,U & -\left(\sqrt{2}\,t\right) & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & \sqrt{2}\,t & 0 & -t & -\left(\sqrt{2}\,t\right) & -6\,\mu+2\,U & -t & 0 & -t & 0 & 0 & t & 0 & 0 & 0 \\
0 & 0 & 0 & \frac{-t}{2}+\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & 0 & 0 & -t & -6\,\mu+2\,U & 0 & 0 & 0 & -\mathbf{i}\,\sqrt{\frac{3}{2}}\,t+\frac{t}{\sqrt{2}} & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -6\,\mu+U & -\left(\sqrt{2}\,t\right) & 0 & 0 & 0 & 0 & -\mathbf{i}\,\sqrt{\frac{3}{2}}\,t-\frac{t}{\sqrt{2}} & 0 \\
t & 0 & 0 & 0 & 0 & 0 & -t & 0 & -\left(\sqrt{2}\,t\right) & -6\,\mu+U & -t & -\mathbf{i}\,\sqrt{\frac{3}{2}}\,t+\frac{t}{\sqrt{2}} & 0 & 0 & 0 & \frac{-t}{2}-\frac{\mathbf{i}}{2}\,\sqrt{3}\,t \\
0 & 0 & \sqrt{2}\,t & 0 & 0 & 0 & 0 & 0 & 0 & -t & -6\,\mu+U & 0 & 0 & 0 & \frac{t}{2}-\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & 0 \\
0 & -\left(\sqrt{2}\,t\right) & 0 & 0 & 0 & 0 & 0 & \mathbf{i}\,\sqrt{\frac{3}{2}}\,t+\frac{t}{\sqrt{2}} & 0 & \mathbf{i}\,\sqrt{\frac{3}{2}}\,t+\frac{t}{\sqrt{2}} & 0 & -6\,\mu+U & 0 & 0 & -\left(\sqrt{2}\,t\right) & 0 \\
\frac{-t}{2}-\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & 0 & 0 & t & 0 & 0 & t & 0 & 0 & 0 & 0 & 0 & -6\,\mu+U & \frac{-3\,t}{2}-\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & 0 & 0 \\
0 & \frac{t}{2}-\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & -\left(\sqrt{2}\,t\right) & 0 & \frac{3\,t}{2}-\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{-3\,t}{2}+\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & -6\,\mu+U & 0 & 0 \\
\frac{t}{2}-\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & 0 & 0 & t & 0 & 0 & 0 & 0 & \mathbf{i}\,\sqrt{\frac{3}{2}}\,t-\frac{t}{\sqrt{2}} & 0 & \frac{t}{2}+\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & -\left(\sqrt{2}\,t\right) & 0 & 0 & -6\,\mu+U & -t \\
0 & \frac{-3\,t}{2}-\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & 0 & 0 & \frac{t}{2}+\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & 0 & 0 & 0 & 0 & \frac{-t}{2}+\frac{\mathbf{i}}{2}\,\sqrt{3}\,t & 0 & 0 & 0 & 0 & -t & -6\,\mu+U
\end{bmatrix}
$$