$$
\begin{aligned}
\Psi_{22} &= C_1\left(|0002\rangle + |0020\rangle + |0200\rangle + |2000\rangle\right) \\
&\quad + C_2\left(-|0d0u\rangle + |0u0d\rangle - |d0u0\rangle + |u0d0\rangle\right) \\
&\quad + C_3\left(-|00du\rangle + |00ud\rangle - |0du0\rangle + |0ud0\rangle - |d00u\rangle - |du00\rangle + |u00d\rangle + |ud00\rangle\right)
\end{aligned}
$$

$$
C_1 = \frac{6\,i\,\sqrt{2}\,t\left(-36\,t^2\,U + U^3 + 6\,\sqrt{6}\,\sqrt{-\left(t^2\,\left(512\,t^4 + 26\,t^2\,U^2 + U^4\right)\right)}\right)^{\frac{1}{3}}}{-48\,\left(-i+\sqrt{3}\right)\,t^2 - \left(-i+\sqrt{3}\right)\,U^2 + 4\,i\,U\left(-36\,t^2\,U + U^3 + 6\,\sqrt{6}\,\sqrt{-\left(t^2\,\left(512\,t^4 + 26\,t^2\,U^2 + U^4\right)\right)}\right)^{\frac{1}{3}} + \left(i+\sqrt{3}\right)\,\left(-36\,t^2\,U + U^3 + 6\,\sqrt{6}\,\sqrt{-\left(t^2\,\left(512\,t^4 + 26\,t^2\,U^2 + U^4\right)\right)}\right)^{\frac{2}{3}}}
$$

$$
C_2 = \frac{6\,i\,\sqrt{2}\,t\left(-36\,t^2\,U + U^3 + 6\,\sqrt{6}\,\sqrt{-\left(t^2\,\left(512\,t^4 + 26\,t^2\,U^2 + U^4\right)\right)}\right)^{\frac{1}{3}}}{-48\,\left(-i+\sqrt{3}\right)\,t^2 + \left(-U + \left(-36\,t^2\,U + U^3 + 6\,\sqrt{6}\,\sqrt{-\left(t^2\,\left(512\,t^4 + 26\,t^2\,U^2 + U^4\right)\right)}\right)^{\frac{1}{3}}\right)\,\left(\left(-i+\sqrt{3}\right)\,U + \left(i+\sqrt{3}\right)\,\left(-36\,t^2\,U + U^3 + 6\,\sqrt{6}\,\sqrt{-\left(t^2\,\left(512\,t^4 + 26\,t^2\,U^2 + U^4\right)\right)}\right)^{\frac{1}{3}}\right)}
$$

$$
C_3 = \frac{-1}{2\,\sqrt{2}}
$$