



\Leftrightarrow

$$\begin{aligned}
 C^{0,2}\hat{U}^1 &= |0\rangle\langle 0|^0 \otimes \hat{I}^{1,2} + |1\rangle\langle 1|^0 \otimes C^2\hat{U}^1 \\
 &= \hat{I}^{0,1} \otimes |0\rangle\langle 0|^2 + C^0\hat{U}^1 \otimes |1\rangle\langle 1|^2 \\
 &= \hat{I} \otimes \hat{I} \otimes \hat{I} + |1\rangle\langle 1| \otimes (\hat{U} - \hat{I}) \otimes |1\rangle\langle 1|
 \end{aligned}$$