Let $G$ be a permutation group on $\Omega$. A 2-orbit is an orbit of $G$ in its induced action on $\Omega \times \Omega$. Recall that the number of 2-orbits is called the rank of $G$, and the largest permutation group on $\Omega$ having the same 2-orbits as $G$ is called the 2-closure of $G$.

If the order of $G$ is even, then a nondiagonal 2-orbit of $G$ induces a strongly regular graph called a rank 3 graph. The full automorphism group of that graph is precisely the 2-closure of the corresponding group.

We present the description of 2-closures of rank 3 groups of sufficiently large degree. Groups are organized into several families, based on the combinatorial structures preserved, and the full automorphism groups of the corresponding structures are given. The proof heavily relies on the classification of rank 3 groups and on known results about automorphisms of strongly regular graphs.