Abstract. Let α be a $\mathbf{Z}^d$-action ($d \geq 2$) by automorphisms of a compact metric abelian group. For any non-linear shape $I \subset \mathbf{Z}^d$, there is an α with the property that I is a minimal mixing shape for α. The only implications of the form "I is a mixing shape for $\alpha \implies J$ is a mixing shape for α" are trivial ones for which I contains a translate of J.

If all shapes are mixing for α, then α is mixing of all orders. In contrast to the algebraic case, if β is a $\mathbf{Z}^d$-action by measure-preserving transformations, then all shapes mixing for β does not preclude rigidity.

Finally, we show that mixing of all orders in cones — a property that coincides with mixing of all orders for $\mathbf{Z}$–actions — holds for algebraic mixing $\mathbf{Z}^2$-actions.