The operation is equivalent to finding the lexicographically previous permutation, so the problem means counting the number of lexicographically smaller permutations. DP on digits, precompute the inversions of $1, \ldots, n \bmod P$ in $O(n)$ time. $O(n \log |\Sigma|)$ using segment tree, or $O(n \frac{\log |\Sigma|}{\sqrt{\log n}})$ by inversion counting [1].

References

[1] Timothy M. Chan and Mihai Pătraşcu. Counting inversions, offline orthogonal range counting, and related problems. In *Proceedings of the twenty-first annual ACM-SIAM symposium on Discrete Algorithms*, pages 161–173. Society for Industrial and Applied Mathematics, 2010.