The satisfiability problem (SAT) is a classical NP-complete problem, which is difficult from the viewpoint of computational complexity. However, recent advances in algorithms and hardware have made it possible to solve logic formulas with 1 million variables and 10 million constraints, depending on the problem. Therefore, the approach of converting problems to SAT and solving them with SAT solvers is used in various fields such as model checking and electric circuit generation. The problem descriptions of SAT are composed of various constraints, and At-Most-K constraints are often the bottleneck of the computation time [1]. At-Most-K constraint is true if and only if at most K of entire logic variables are true. The simplest encoding method for At-Most-K constraints is Pairwise Encoding. This method requires O(n^2) number of CNF clauses for n of number of target variables, which causes an exponential increase in the size of logical expressions for target variables. In this study, we propose Fractional Encoding as an encoding method for At-Most-K constraints to reduce the size of logical expressions. Fractional Encoding distributes logical expressions by dividing the set of target variables into multiple parts. Simply by dividing the set of variables into m parts and applying Pairwise Encoding to each part of the set, the number of target variables n can be reduced to 1/m. However, if the set is simply partitioned, the number of possible combinations of variables (degrees of freedom) that can be the solution is greatly reduced. Therefore, Fractional Encoding employed auxiliary variables to enable increasing and decreasing the number of true variables among the partitioned sets and suppresses the reduction of the degrees of freedom.