The main objective of this study is to determine the rates of vertically and horizontally oriented drilling processes in marble quarries and to observe the factors affecting the drilling rates in terms of physical and mechanical properties of the rocks. In-situ drilling tests were performed in different marble quarries with different marble types and drilling times and penetration rates for a series of successive depth-increments were trying to be determined under vertically and horizontally oriented conditions. In order to understand the relation between the parameters that are investigated within the scope of this research, Uniaxial compressive strength, Brazilian tensile strength, Impact strength, Bohme abrasion strength, P-wave velocity, Porosity, Unit volume weight, Schmidt Hardness Index and Brittleness index values were correlated with the drilling rates. It was noticed that the Porosity and Unit volume weight could be taken as the key parameters among them for obtaining meaningful correlation with drilling performance. It was also observed that the physical and mechanical rock properties are more relevant in vertical drilling than horizontal drilling.