

# The response mechanism and testing method of the rock elastic modulus while drilling

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**Abstract:** The elastic modulus is a basic parameter reflecting the deformation resistance and energy concentration characteristics of rock. The traditional testing method of the rock elastic modulus needs to core the surrounding rock and testing it in the laboratory, which has difficulty reflecting the rock mechanical properties under the engineering site environment, and uncontrolled broken surrounding rock is difficult to core for testing. Digital drilling technology provides a new idea for in situ testing of the rock's elastic modulus. The key is to establish a quantitative relationship between the elastic modulus and drilling data. In this paper, the relationship between rock cutting energy density and drilling data is established, and a series of rock digital drilling tests are carried out. The response law of the drilling data and cutting energy density to the rock elastic modulus is clarified. The inversion model of the rock elastic modulus while drilling (*DP-E* model) is established. The verification test results indicate that the average difference rate of the test results based on the *DP-E* model is 7.06% compared with the compression test method, which verifies the effectiveness of the model. This study provides a theoretical basis for in situ testing of the rock elastic modulus.

**Keywords:** Digital drilling; cutting energy density; elastic modulus; inversion model; measurement method