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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 24191-2009

**Steel wire ropes -- Determination of the actual modulus of
elasticity**

钢丝绳 实际弹性模量测定方法

(English Translation)

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1 Scope

This Standard specifies the method for determining the actual modulus of elasticity of steel wire ropes within a specified load range by testing and calculation.

This Standard applies to the determination of the actual modulus of elasticity of steel wire ropes.

2 Normative references

The terms in the following documents become the terms of this Standard by reference to this Standard. For dated references, all subsequent amendments (not including errata content) or revisions do not apply to this standard. However, parties to agreements that are based on this Standard are encouraged to study whether the latest versions of these documents can be used. For undated references, the latest edition applies to this Standard.

GB/T 8170, Rules of rounding off for numerical values & expression and judgment of limiting values

GB/T 16825.1, Verification of static uniaxial testing machines. Part 1:

Tension/compression testing machines. Verification and calibration of the force-measuring system (GB/T 16825.1-2008, ISO 7500-1:2004, IDT)

3 Terms and definitions

The following terms and definitions are applicable to this Standard.

3.1 Initial rope modulus

E_i

The constant in the stress-strain relationship curve that is determined when the steel wire rope is first loaded after the steel wire rope is manufactured.

3.2 Partially-bedded rope modulus

E_{p-b}

When it is required to determine the initial rope modulus, continue to apply a load that does not exceed 30% of the minimum breaking force or the nominal breaking load of the steel wire rope ($F_{30\%}$) to the sample; at the same time, record the extensometer readings x_1 and x_2 that correspond to $F_{10\%}$ and $F_{30\%}$ of the minimum breaking force and the nominal breaking load of the steel wire ropes.

When it is required to determine the partially-bedded rope modulus or the fully-bedded rope modulus, continue to apply a load that does not exceed 50% of the minimum breaking force or the nominal breaking load of the steel wire rope to the sample; then, reduce the load to 5% of the minimum breaking force or the nominal breaking load of the steel wire ropes.

Load and unload to the steel wire rope sample in a repetitive manner, until the sample reaches the required partially-bedded condition or fully-bedded condition.

If the steel wire rope sample stops repetitive cycling before reaching the bedded condition, that is, the steel wire rope stops repetitive cycling only in the partially-bedded condition; then, record the number of the repetitive cycling [see Chapter

9 h].

If other maximum and minimum loads are used, the difference shall not be greater than 20% of the minimum breaking force or the nominal breaking load of the steel wire rope.

Note: Elongation hysteresis can be observed during loading and unloading of steel wire rope sample. To avoid confusion, the elongation reading that is used to calculate the modulus of elasticity shall be read when the load increases.

The applied load shall then be equal to 10% of the minimum breaking force or the nominal breaking load of the steel wire rope; record the force value ($F_{10\%}$) and the extensometer reading (x_1); increase the load to 30% of the minimum breaking force or the nominal breaking load of the steel wire rope; at the same time, record the force value ($F_{30\%}$) and

the extensometer reading ($\times 2$). Upon agreement between the supplier and the buyer, other force range (such as wire rope for elevators) can be used.

The numerical rounding shall meet the requirements of GB/T 8170.

8 Calculation of actual modulus of elasticity

According to the test results (data) in Chapter 7, the actual modulus of elasticity of the steel wire rope E 10-30 shall be calculated according to Formula (1):