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

GB/T 13320-2007

**Metallographic grading atlas and assessing method for steel
die forgings**

(English Translation)

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Table of Contents

Foreword...	3
1 Scope...	4
2 Terms and definitions...	4
3 Grouping and grading of grading atlas...	5
4 Application of grading atlas...	5
5 Sample selection and preparation...	5
6 Assessment of metallographic structure...	6

Foreword

This Standard replaces GB/T 13320-1991, Metallographic grading atlas and assessing method for steel die forgings.

Compared with GB/T 13320-1991, the main changes of this Standard are as follows.

- Add terms and definitions, i.e., "isothermal normalization", "control cooling after forging" process and "effective thickness";
- Remove the words "automobiles, tractors, general machinery" in the scope of application;
- Cancel the various steel grades listed in Chapter 2 of the original standard;
- Combine the third and fourth groups of grading atlases of the original standard into the third group of grading atlases of this standard, i.e., grading atlas of forgings made of quenched and tempered steel;
- Cancel Subclause 3.2 of the original standard;
- Cancel the words "two representative places may be taken" in 4.1 of the original standard, and replace the preparation of samples by 5.2 of this standard;
- Cancel the method of "can be expressed in half-grade" in 5.1 of the original standard;
- Cancel the descriptions of words such as "part" and "a small amount" in the

figures, and use shapes and uniformity to describe the situation instead.

Appendix A of this Standard is an informative appendix.

This Standard was proposed by China Machinery Industry Federation.

This Standard shall be under the jurisdiction of National Technical Committee 74 on Forging of Standardization Administration of China.

Drafting organization of this standard. Faw Bharat Forge Co., Ltd.

Main drafters of this Standard. Yang Jianjun, Lu Dongyuan, Wang Dewei.

The previous versions of the standards which are replaced by this Standard are.

-- GB/T 13320-1991.

Metallographic grading atlas and assessing method for steel
die forgings

1 Scope

This Standard specifies the metallographic grading atlas (hereinafter referred to as grading atlas) and assessing method for steel die forgings.

This Standard applies to structural steel die forgings that have been subjected to quenching and tempering, normalizing, isothermal normalization, and control cooling after forging.

This Standard is not applicable to the assessment of decarburization, overheating, over-burning and other microstructures of forgings.

2 Terms and definitions

The following terms and definitions are applicable to this Standard.

2.1

isothermal normalization

A heat treatment process in which the forging is heated to a temperature higher than Ac₃ (or Ac₁), kept at that temperature for a period of time, then cooled to a temperature in the pearlite transformation zone and kept isothermally for a period of time to transform the austenite into a pearlite structure, and then cooled in air.

2.2

control cooling after forging

A process of controlling the cooling rate of the forging by residual heat so that the forging, after forming, obtains pearlite plus ferrite or bainite structure.

2.3

effective thickness

When the wall thickness of different parts of the forging is different, if determining the heating time according to the wall thickness at a certain place can ensure the quality of heat treatment, then the wall thickness at that place is called the effective thickness of the forging.

3 Grouping and grading of grading atlas

The grading atlases are divided into the following three groups, each with 8 grades.

The first group of grading atlases is shown in Figure 1, which is applicable to forgings of medium carbon structural steel that have been subjected to normalizing and forgings of medium carbon low alloy non-quenched-and-tempered steel that have been subjected to control cooling after forging.

The second group of grading atlases is shown in Figure 2, which is applicable to forgings that have been subjected to carburizing steel normalizing, isothermal normalization and control cooling after forging.

The third group of grading atlases is shown in Figure 3, which is applicable to forgings made of quenched and tempered steel.

4.1 The qualified grades of various metallographic structures in the grading atlas shall

be determined by negotiation between the supplier and the buyer. If there is no agreement, grades 1 ~ 4 are considered qualified.

4.2 If there is any dispute during the grading, the mechanical properties test results can

be used as a reference for determination.

5.1 Determination of sampling location

It shall be determined by negotiation between the supplier and the buyer. If there is no agreement, the effective thickness of the forging shall be used as the sampling location. For examples showing sampling locations, see Appendix A (informative).

5.2 Preparation of samples

Generally, it shall be determined based on the technical agreement between the supplier and the buyer. If there is no agreement, it shall be determined based on the following principles.

5.2.1 When the effective thickness of the sampling location of the forging is ≤ 20 mm,

one-half of it shall be used as the inspection part.

5.2.2 When the effective thickness of the sampling location of the forging is > 20 mm,

samples shall be taken 10 mm from the surface as the inspection part.

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