NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 224-2019

Determination of the depth of decarburization of steels

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Foreword

This Standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This Standard replaces GB/T 224-2008 "Determination of depth of decarburization of steels".

Compared with GB/T 224-2008, the main technical changes in this Standard are as follows:

- deleted the term "ferrite decarburization depth" and its definition (Clause 3 of Edition 2008);
- modified "sampling" (see Clause 4 of this Edition, third paragraph in 4.1, 4.2.2, 4.4.1 and 4.4.2 of Edition 2008);
- added average method (see 5.2.3 of this Edition);
- added specific contents of microscopic knoop hardness method and microhardness indentation (see 5.3.1 of this Edition);
- added electron probe method (see 5.4.4 of this Edition);
- added glow spectroscopy (see 5.4.5 of this Edition);
- added precise digits that different measurement methods correspond to decarburization depths (see Clause 6 of this Edition).

This Part uses redrafting method to modify and adopt ISO 3887:2017 "Steels - Determination of the depth of decarburization".

Technical differences and reasons between this Standard and ISO 3887:2017 are as follows:

- about normative references, this Standard made an adjustment on technical differences, so as to adapt to technical conditions of China. See Clause 2 "Normative references" for the adjustment. Details are as follows:

- used GB/T 4340.1 that adopted international standard to replace ISO 6507-1 (see 5.3.3);

- used GB/T 18449.1 that adopted international standard to replace ISO 4545-1 (see 5.3.3);

- used GB/T 20126 that adopted international standard to replace ISO 15349-2 (see 5.4.2.2);

Determination of the depth of decarburization of steels

1 Scope

This Standard specifies requirements for sampling, determination method and test report of steel decarburization.

This Standard is applicable to measuring depths of decarburization of steel (blank) and its parts.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 4336, Carbon and low-alloy steel - Determination of multi-element contents - Spark discharge atomic emission spectrometric method (routine method)

GB/T 4340.1, Metallic materials - Vickers hardness test - Part 1: Test method (GB/T 4340.1-2009, ISO 6507-1:2005, MOD)

GB/T 13298, Inspection methods of microstructure for metals

GB/T 15247, Microbeam analysis - Electron probe microanalysis - Guidelines for determining the carbon content of steels using calibration curve method (GB/T 15247-2008, ISO 16592:2006, IDT)

GB/T 18449.1, Metallic materials - Knoop hardness test - Part 1: Test method (GB/T 18449.1-2009, ISO 4545-1:2005, MOD)

GB/T 19502, Surface chemical analysis - Glow discharge optical emission spectrometry (GD-OSE) - Introduction to use (GB/T 19502-2004, ISO 14707:2000, IDT)

GB/T 20126, Unalloyed steel - Determination of low carbon content - Part 2: Infrared absorption method after combustion in an induction furnace (with preheating) (GB/T 20126-2006, ISO 15349-2:1999, IDT)

GB/T 22368, Low-alloy steel - Determination of multi-element contents - Glow discharge optical emission spectrometry (Routine method)

GB/T 30067, Standard terminology relating to metallography

ISO 9556, Steel and iron - Determination of total carbon content - Infrared absorption method after combustion in an induction furnace

ISO 14594, Microbeam analysis - Electron probe microanalysis - Guidelines for the determination of experimental parameters for wavelength dispersive spectroscopy

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T

3.1 decarburization

Loss of carbon on steel surface. Such loss of carbon includes:

a) partial decarburization: carbon content on surface of steel sample is reduced below carbon content of substrate, and is greater than solid solution limit of carbon in ferrite at room temperature;

b) complete decarburization: is also called as ferrite decarburization; surface

carbon content of sample is lower than maximum solid solubility of carbon in ferrite; only ferrite exists.

NOTE: Complete decarburization described in b) has only ferrite structure. It shall use metallographic method to determine.

3.2 depth of functional decarburization

Distance from sample surface to point of specified carbon content or point of hardness level. Specified carbon content or hardness level shall be based on that use performance is not affected by decarburization (for example, minimum carbon content specified in product standard).

3.3 depth of total decarburization

Distance from sample surface to the point of which carbon content is equal to substrate carbon content. It is equal to the sum of partial decarburization and complete decarburization.

See Figure 1 for different decarburization zones.

W - width;

A - area of inspection surface of steel plate or rectangular sample.

Figure 4 -- Typical sampling method for steel plate and rectangular steel

4.4 Sample for chemical analysis shall have a sufficient length, so as to ensure quantity of turnings that are continuously increased by chemical analysis. Or it shall have a large enough area to meet spectral analysis area.

5.1.1 Selection of determination method and its precision depend on product's degree of decarburization, microstructure, carbon content as well as part's shape. Final product usually uses following methods to measure depth of decarburization:

a) metallographic method (see 5.2);

b) microhardness method (see 5.3); it can use Vickers hardness or Knoop hardness;