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Carburizing bearing steel forgings - Technical specifications

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1 Scope

Recommended national standard for the carburizing bearing steel forgings from which rolling bearing rings and rolling elements are made. It sets the ordering requirements, the manufacturing process, the technical requirements, the inspection rules and test methods, the acceptance and quality certificate, and the marking and packaging, and it applies to the ordering, manufacture and inspection of high-quality forgings of this kind. Melting is by ladle refining, or ladle refining followed by electroslag remelting, and the forgings are supplied normalized, tempered and annealed unless the parties agree otherwise; the ingot must be cropped enough at both ends that the forging is free of pipe, porosity and severe segregation. The inspection clause fixes the whole metallurgical acceptance: Brinell hardness to GB/T 231.1, macrostructure by acid etching at 60 degrees Celsius to 80 degrees Celsius or by electrolytic corrosion in 15 % to 20 % hydrochloric acid rated against GB/T 1979, non-metallic inclusions by method A of GB/T 10561-2005 on a 20 mm by 20 mm specimen taken midway between centre and surface, and grain size to GB/T 6394, with at most two reheat treatments allowed on a non-conforming batch. An informative annex adds the requirements that apply only when the contract calls for them, among them residual element analysis, the "SAM" inclusion rating system and the ban on deliberate calcium addition. Issued on 28 February 2017 and in force since 1 September 2017, it is a first edition.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 223 (all parts) Methods for chemical analysis of iron, steel and alloy · GB/T 224 Determination of depth of decarburization of steels · GB/T 225 Steel - Hardenability test by end quenching (Jominy test) · GB/T 226 Test method for macrostructure and defect of steel by etching · GB/T 231.1 Metallic materials - Brinell hardness test - Part 1: Test method · GB/T 908 Forged round and square steels - Dimensions, shape, weight and tolerances · GB/T 1979 Standard diagrams for macrostructure and defect of structural steels · GB/T 6394 Metals - Methods for estimating the average grain size · GB/T 6402 Steel forgings - Method for ultrasonic examination · GB/T 10561-2005 Steel - Determination of content of non-metallic inclusions - Micrographic method using standard diagrams · GB/T 20066 Steel and iron - Sampling and preparation of samples for the determination of chemical composition · GB/T 21469 Machining allowances and tolerances for steel open die forgings on hammer - General requirements · GB/T 21470 Machining allowances and tolerances for steel open die forgings on hammer - Disks, columns, rings and seamless cylindrical sleeves · GB/T 21471 Machining allowances and tolerances for steel open die forgings on hammer - Shafts · JB/T 9179 (all parts) Machining allowances and tolerances of open die forgings on hydraulic press

3 Ordering requirements

The contract shall state the name, the material grade, the delivery condition and the quantity. The purchaser or the supplier provides the order drawings and the technical documentation approved by both parties. Forgings are delivered normalized, tempered and annealed, or in the condition agreed.

4 Manufacturing process

Melting is by ladle refining, or by ladle refining followed by electroslag remelting; other methods that guarantee the quality are permitted.

Forging starts from ingots or from rolled or forged stock, with enough cropping at both ends of the ingot to avoid pipe, porosity and severe segregation.

6 Inspection rules and test methods

Hardness is measured to GB/T 231.1.

Macrostructure is revealed either by etching in 1:1 hydrochloric acid at 60 degrees Celsius to 80 degrees Celsius to GB/T 226, or by electrolytic corrosion in 15 % to 20 % industrial hydrochloric acid by volume at 30 degrees Celsius, at under 20 V, with a current density of 0.1 A/cm² to 1 A/cm² for 15 min to 20 min, the surface parallel to the electrode and the poles not less than 20 mm apart; it is rated against GB/T 1979.

Non-metallic inclusions are determined by method A of GB/T 10561-2005 on a 20 mm by 20 mm specimen taken midway between the centre and the surface, and the grain size to GB/T 6394.

Non-conforming pieces may be renormalized, retempered or reannealed and reassessed, not more than twice.

A Annex A (Informative) Supplementary technical requirements

These apply only where the contract calls for them: analysis of the residual elements titanium, aluminium and oxygen; the "SAM" inclusion rating system, with two grades reflecting type B and type D inclusions; a ban on adding calcium without the purchaser's authorisation, lime and fluorite being permitted in slagging; and a magnetic particle method as an alternative to the inclusion rating.