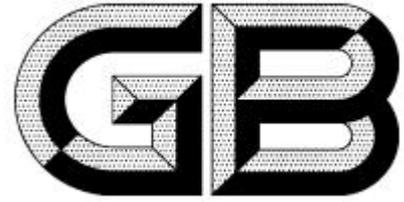


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CNC plate bending machine

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Foreword

This document is drafted in accordance with the provisions of GB/T 1.1-2020 Directives for Standardization—Part 1: Structure and Drafting Rules for Standard Documents.

This document replaces GB/T 30463-2013 CNC Plate Bending Machines. Compared with GB/T 30463-2013, the main technical changes are as follows:

- a) Revised the scope of application (see Chapter 1, Chapter 1 of the 2013 edition);
- b) Revised the parameters of CNC plate bending machines (see Chapter 4, Chapter 4 of the 2013 edition);
- c) Added requirements for the residual straight section after pre-bending (see 5.2.5);
- d) Added requirements for the maximum thickness of pre-bent plates (see 5.2.6);
- e) Revised the requirements for deflection (see 5.2.8, 5.4 of the 2013 edition);
- f) Revised the requirements for work roll materials (see 5.5.3, 5.6.3 of the 2013 edition);
- g) Revised the requirements for CNC systems (see 5.7, 5.8 of the 2013 edition);
- h) Deleted the requirements for sheet feeding accuracy and work roll displacement positioning accuracy (see Table 3 of the 2013 edition);
- i) Added requirements for working accuracy (see Chapter 6);
- j) Revised the requirements for the oil inlet temperature of hydraulic pumps (see 5.2.9, 7.14.2 of the 2013 edition);
- k) Revised the requirements for load tests (see 7.14, 7.15 of the 2013 edition).

Attention should be paid to the fact that certain contents of this document may involve patents. The issuing authority of this document shall not be liable for identifying any patents.

This document is proposed by the China Machinery Industry Federation.

This document is administered by the National Technical Committee on Forging and Pressing Machinery Standardization (SAC/TC220).

CNC plate bending machine

1 Scope

This document specifies the parameters, technical requirements, accuracy, inspection rules, packaging, transportation and storage of CNC plate bending machines, and describes the corresponding inspection methods.

This document applies to the three-roll and four-roll structural types of CNC plate bending machines used for rolling plates under cold state (normal temperature) conditions.

2 Normative References

The contents of the following documents constitute indispensable provisions of this document through normative reference in the text. For dated reference documents, only the edition corresponding to that date applies to this document; for undated reference documents, the latest edition (including all amendments) applies to this document.

GB/T 191 Packaging—Transport Packages—Graphical Symbols for Handling

GB/T 3168 Numerically Controlled Machine Tools—Graphical Symbols for Operation Instructions

GB/T 3766 Hydraulic Fluid Power—General Rules and Safety Requirements for Systems and Their Components

GB/T 5226.1 Mechanical Safety—Electrical Equipment of Machines—Part 1: General Requirements

GB/T 6402-2008 Steel Forgings—Ultrasonic Testing Method

GB/T 6576 Machine Tools—Lubrication Systems

GB/T 7935 Hydraulic Components—General Technical Specifications

GB/T 9969 General Rules for Instruction Manuals of Industrial Products

GB/T 10923 Metalforming Machinery—General Principles for Accuracy Inspection

GB/T 13306 Nameplates

GB 17120 Metalforming Machinery—Safety Technical Requirements

GB/T 23281 Metalforming Machinery—Terminology

GB/T 26220 Industrial Automation Systems and Integration—Numerical Control of Machine Tools—General Technical Requirements for CNC Systems

GB/T 36484 Metalforming Machinery—Terminology

JB/T 1829 Metalforming Machinery—General Technical Requirements

JB/T 3240 Metalforming Machinery—Graphical Symbols for Operation Instructions

JB/T 8356 Machine Tools—Packaging—Technical Requirements

JB/T 8609 Metalforming Machinery—Welded Components—Technical Requirements

JB/T 9954 Metalforming Machinery—Hydraulic Systems—Cleanliness

3 Terms and Definitions

The terms and definitions specified in GB/T 36484 and the following apply to this document.

3.1 CNC plate bending machine

A plate bending machine in which the rotational motion and linear motion displacements of the working rollers are controlled by a numerical control system.

3.2 minimum diameter of coiling block for maximum plate rolling specification

The minimum inner diameter of the coiling block that can be rolled under the conditions of maximum plate rolling width, specified material yield strength, maximum thickness of pre-bent plates, and maximum thickness of symmetrically rolled plates.

3.3 symmetrical rolling

Bending a plate to a specified diameter when the upper roller is symmetrical relative to the two lower rollers or the two side rollers.

3.4 pre-bending

Bending the two ends of a plate to a specified diameter when the upper roller is asymmetrical relative to the two lower rollers, or when the upper roller works with the lower and side rollers.

3.5 pre-bent residual straight section

The length of the two ends of a rolled plate that cannot be pre-bent during the pre-bending process.

3.6 maximum thickness of symmetrically rolled plates

The maximum thickness of a plate that can be bent during symmetrical rolling at the minimum diameter of the coiling block for maximum plate rolling specification, under the conditions of maximum plate rolling width and specified material yield strength.

3.7 maximum thickness of pre-bent plates

The maximum thickness of a plate that can be bent during pre-bending at the minimum diameter of the coiling block for maximum plate rolling specification, under the conditions of maximum plate rolling width and specified material yield strength.

3.8 synchronization accuracy of working roller ends

The absolute value of the difference in actual displacement between the two ends of a working roller of a CNC plate bending machine after the horizontal or lifting movement of the roller stops under no-load condition.

3.9 equidistance accuracy of working rollers

The absolute value of the distance difference between the two ends of one working roller relative to another working roller of a CNC plate bending machine under load condition.

4 Types and Parameters

4.1 The types of CNC plate bending machines include:

- CNC three-roll plate bending machine;
- CNC four-roll plate bending machine.

4.2 The parameters of CNC plate bending machines include the following items:

- Maximum thickness of symmetrically rolled plates (main parameter);
- Maximum plate rolling width (main parameter);
- Minimum diameter of coiling block for maximum plate rolling specification.

4.3 The parameter series of maximum thickness of symmetrically rolled plates (unit: mm) are: 8, 10, 12, 16, 20, 25, 30, 32, 40, 50, 60, 70, 80, 100, 120, 140, 150, 160, 180, 200, 250, 280, 300, 320, 350.

4.4 The parameter series of maximum plate rolling width (unit: mm) are: 1000, 1600, 2000, 2500, 3000, 3200, 3500, 4000, 4200, 4500, 5000, 6000, 8000, 10000, 12000, 14000, 16000, 18000, 21000, 22000, 24000.

4.5 The parameter of minimum diameter of coiling block for maximum plate rolling specification shall comply with the following requirements:

- When the maximum plate rolling thickness ≤ 60 mm, it shall be 2.5 times the diameter of the upper working roller;
- When the maximum plate rolling thickness > 60 mm, it shall be 3 times the diameter of the upper working roller.

4.6 The parameter design of CNC plate bending machines shall be based on rolled plates with a yield strength of 245 MPa.

5 Technical Requirements

5.1 General Requirements

5.1.1 CNC plate bending machines shall be manufactured in accordance with the drawings and technical documents approved in accordance with the specified procedures.

5.1.2 The modeling and layout of CNC plate bending machines shall take into account the requirements of process aesthetics and ergonomics, and shall be convenient for operation, maintenance, assembly, disassembly, lifting and transportation.

5.1.3 The factory delivery of CNC plate bending machines shall ensure completeness. Spare parts, wearing parts and special tools required for the CNC plate bending machine shall be supplied along with the machine as needed; the supply of special accessories shall be negotiated between the supplier and the buyer.

5.1.4 The manufacturer shall guarantee the quality of purchased components (including electrical and hydraulic components) used for the CNC plate bending machine, which shall comply with the provisions of the technical documents. A no-load running test shall be conducted for the purchased components simultaneously with the CNC plate bending machine before factory delivery.

5.1.5 The accompanying technical documents of the CNC plate bending machine shall include a certificate of conformity, a packing list and an operation manual. The operation manual shall contain requirements and instructions for installation, transportation, storage, operation, maintenance and safety, and shall comply with the provisions of GB/T 9969.

5.1.6 CNC plate bending machines shall be equipped with a nameplate as well as various labels or marks for lubrication and safety purposes, which shall comply with the provisions of GB/T 13306. The graphical symbols on the labels shall conform to the requirements of GB/T 3168 and JB/T 3240. All labels shall be firmly and neatly fixed in conspicuous positions on the CNC plate bending machine and shall remain legible.

5.1.7 CNC plate bending machines shall operate normally under the following environmental conditions: ambient temperature ranging from 0°C to 40°C, relative humidity not exceeding 75% at the maximum temperature of 40°C, and altitude below 1000 m.

5.2 Structure and Performance

5.2.1 The main drive of the CNC plate bending machine shall adopt control methods such as proportional control or servo control.

5.2.2 The movement of the working rollers shall adopt control methods such as proportional control or servo control, and shall have at least three speed levels: high, medium and low.

5.2.3 After the process parameters for plate rolling are input, the CNC system shall automatically calculate and generate the working operation program, and the corresponding theoretical forming process parameters shall be stored in the database. After multiple rounds of trial rolling and revision of process parameters, the system shall be applicable to the rolling forming of the same type of workpiece.

5.2.4 The effective length of the working roller surface shall be greater than the maximum plate rolling width, with the

difference not less than 50 mm.

5.2.5 The pre-bent residual straight section shall not exceed 2.5 times the thickness of the pre-bent plate.

5.2.6 The maximum thickness of the pre-bent plate shall not be less than 0.8 times the maximum thickness of the symmetrically rolled plate.

5.2.7 Dust-proof devices shall be installed on gears for mechanical transmission and other parts susceptible to wear caused by dust and debris.

5.2.8 Key components such as working rollers and frames shall meet the rigidity requirements. The CNC plate bending machine shall operate normally under the working conditions of maximum load and maximum plate width (uniform load), and the deflection of the working rollers shall not exceed 1/1000 of the distance between the centers of the supporting bearings at both ends of the working roller.

5.2.9 During the no-load running test of the CNC plate bending machine, the temperature rise and maximum temperature shall comply with the following provisions:

— The temperature rise of sliding bearings shall not exceed 40°C, and the maximum temperature shall not exceed 70°C;

— The temperature rise of rolling bearings shall not exceed 40°C, and the maximum temperature shall not exceed 70°C;

— The temperature rise of sliding guideways shall not exceed 15°C, and the maximum temperature shall not exceed 50°C;

— The oil inlet temperature of the hydraulic pump shall not exceed 55°C.

5.2.10 During the load test, all systems including mechanical, electrical and hydraulic systems of the CNC plate bending machine shall operate stably and reliably, and no leakage shall occur in the hydraulic system.

5.3 Safety and Protection

5.3.1 CNC plate bending machines shall be equipped with safety protection devices or guards, which shall comply with the provisions of GB 17120.