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General Technical Conditions for Down-the-hole Drilling Rigs and Drilling Machinery

潜孔钻机和钻凿机械通用技术条件

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Table of Contents

General Technical Conditions for Down-the-hole Drilling Rigs and Drilling Machinery

1 Scope

This document specifies the general technical specifications that shall be followed by down-the-hole drilling rigs and drilling machinery products. The content includes the terms and definitions, model naming requirements, safety requirements, general technical requirements, test methods, inspection rules, and the requirements for marking, packaging, transportation and storage of this type of machinery products.

This Standard is applicable to down-the-hole drilling rigs and drilling machinery products produced within Hebei Province.

2 Normative References

The following documents are indispensable to the application of this document. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 156 Standard Voltages

GB 755 Rotating Electrical Machines - Rating and Performance

GB 3836.1 Explosive Atmospheres - Part 1: Equipment - General Requirements

GB 3836.2 Electrical Apparatus for Explosive Gas Atmospheres - Part 2: Flameproof Enclosure “d”

GB 3836.3 Electrical Apparatus for Explosive Gas Atmospheres - Part 3: Increased Safety “e”

GB 3836.4 Electrical Apparatus for Explosive Atmospheres- Part 4: Intrinsically Safe Circuits and Electrical Apparatus “i”

GB 3836.5 Electrical Apparatus for Explosive Gas Atmosphere - Part 5: Pressurized Enclosures “p”

GB 3836.6 Electrical Apparatus for Explosive Gas Atmosphere - Part 6: Oil-immersion “o”

GB 3836.7 Electrical Apparatus for Explosive Gas Atmosphere - Part 7: Power Filling “q”

GB 3836.8 Electrical Apparatus for Explosive Gas Atmospheres - Part 8: Type of Protection “n”

GB 3836.9 Electrical Apparatus for Explosive Gas Atmospheres - Part 9: Encapsulation “m”

GB 4351.1 Portable Fire Extinguishers - Part 1: Performance and Construction

GB 5226.1 Electrical Safety of Machinery - Electrical Equipment of Machines - Part 1: General Requirements

GB/T 6921 Determination of the Concentration of Airborne Particulate Matters

GB/T 7679.1 Mining Machinery Terminology - Part 1: Mining Equipment

GB/T 8196 Safety of Machinery - Guards - General Requirements for the Design and Construction of Fixed and Movable Guards

GB/T 10095.1 Cylindrical Gears - System of Accuracy - Part 1: Definitions and Allowable Values of Deviations Relevant to Corresponding Flanks of Gear Teeth

GB/T 10095.2 Cylindrical Gears - System of Accuracy - Part 2: Definitions and Allowable Values of Deviations Relevant to Radial Composite Deviations and Runout Information

GB/T 13306 Plates

GB/T 13325 Noise Emitted by Machinery and Equipment - Guidelines for the Preparation of Test Codes of Engineering Grade Requiring Noise Measurements at the Operator’s or Bystander’s Position

GB/T 13344 Downhole Drill Hammers and Bits

GB/T 13384 General Specifications for Packing of Mechanical and Electrical Product

GB/T 15706.2 Safety of Machinery - Basic Concepts, General Principles for Design - Part 2: Technical Principles

GB 16754 Safety of Machinery - Emergency Stop - Principles for Design

GB/T 16855.1 Safety of Machinery - Safety-related Parts of Control Systems - Part 1: General Principles for Design

JB/T 1604 Code of Designations for Mining Machinery Products

JB/T 3249 Engineering Machinery Fender and Hood

JB/T 7161 General Specification of Heat-treatment for Rock Drilling Machines and Pneumatic Tools

JB/T 7164 Rock Drilling Machines and Pneumatic Tools - General Specifications for Machined Parts

JB/T 7165 Rock Drilling Machines and Pneumatic Tools - General Specifications for Assembly

danger.

5.2 Basic Safety Requirements for Situations without Driver's Cab

5.2.1 The control mechanisms shall have plates indicating their actions.

5.2.2 The operator's operating position setting shall comply with ergonomic principles.

5.2.3 The control platform shall be set up in a location that is convenient for observation.

5.2.4 Under working conditions, when the ambient noise in the operator's control area is greater than 85 dB(A), a noise reduction device (earplugs or headset) shall be provided.

5.2.5 Under working conditions, when there are splashing objects in the control area or when the dust concentration is excessively high, the operator shall wear a helmet and dust mask.

5.3 General Safety Requirements

5.3.1 All slewing and moving parts, except for the drill rod, propulsion mechanism and traveling mechanism, shall be equipped with protective measures if they are dangerous to the operator. Any dangerous areas or components, such as: transmission, high temperature, circuits and fragile parts, that may be touched by the operator shall be isolated with protective devices (such as: protective covers and protective plates, etc.). The design of the product protective devices shall comply with the requirements of GB/T 8196.

5.3.2 The rated pressure of pipes, hoses and pipe joints shall be not less than the design pressure of the system. The hoses shall be pressure-resistant, oil-resistant, wear-resistant and flexible, and shall be free from damage and aging, etc. Short and complete hoses shall be used as much as possible, and the hoses shall be marked with the allowable working pressure. Hoses or pipes near the driver's operating position shall be equipped with protective guards in accordance with the requirements of JB/T 3249, so as to prevent the pipes or hoses from bursting and injuring the operator.

5.3.3 The energy source of the drilling rig shall be independent, and each independent component shall have a device for disconnecting from the energy source. This type of devices shall be clearly marked. If re-connection may endanger those around them, they shall be able to be locked. After the drilling rig cuts off the energy source, it shall be able to safely release the energy left or stored in the circuit, so that there is no danger to people around it. Certain circuits may remain connected to the energy source in order to clamp workpieces, store information and provide internal lighting. Under this circumstance, special measures shall be taken to protect the safety of the operator.

5.3.4 If there is a risk of contact with hot or cold surfaces, these surfaces shall be equipped with guardrails or covers. The design of sharp edges, corners and protruding parts shall comply with the requirements of GB/T 15706.2.

5.3.5 The design of the handle shall make it easy for the operator to control the entire machine,

and shall ensure that it does not cause injuries, for example, hand pinching, when used.

5.3.6 Various pipeline valves shall be properly sealed, flexibly opened, and shall not leak after closing. Various pipe joints, including the air inlet (oil, water) joints and threaded connections of the machine itself, shall adopt reliable anti-loosening and anti-leakage structures.

5.3.7 The internal combustion rock drills used for operations in underground mines, tunnels and other places shall be able to ensure that their emissions, dust and explosion protection respectively comply with relevant national regulations.

5.3.8 The insulation of electric rock drills shall comply with the regulations of GB 755. If used in explosive gas environments, they must also comply with the stipulations of GB 3836.1 ~ 3836.2.

5.3.9 The layout of various gas and hydraulic pipelines shall be convenient for installation, inspection and maintenance, and they shall be bundled into a bundle during the design.

5.3.10 The safety design of the control system shall comply with the stipulations of GB/T 16855.1.

5.3.11 The mechanism for connecting and unloading the drill rod mechanism shall be safe and reliable. If the drill rod is manually connected and unloaded, the operating procedures must be strictly followed.

5.3.12 On the operating mechanism of the drilling rig, there shall be plates indicating their actions.

5.3.13 The driving and working positions shall have good visibility to ensure that there is no danger to personnel.

5.3.14 When the drilling rig is traveling, operating or stops on a slope with a specified angle, it shall ensure reliable braking and flexible turning, and there shall be no shaking, slipping or loss of control.

5.3.15 Self-propelled drilling rigs shall be equipped with traveling braking system, auxiliary braking system and parking braking system.

5.3.16 The hydraulic system of the drilling rig shall be equipped with a pressure relief device and a pressure safety valve. If an adjustable hydraulic valve is used, then, it shall have an anti-loosening device. Both the hydraulic system and pneumatic device shall be equipped with pressure monitoring devices.

5.3.17 After adjusting the position of the drill frame, it shall be ensured that the top tip is firmly supported, and the screws and nuts are re-tightened.

5.3.18 Drilling rigs equipped with air compressors, engines and motors must have suitable portable fire extinguishers. In addition, within the safe period for use, the quality shall comply with the requirements of GB 4351.1.

6.2 Traveling Part Requirements and Climbing Capability

6.2.1 The self-propelled drilling rig shall smoothly travel, flexibly turn and reliably brake.

6.2.2 The braking distance shall not be greater than 300 mm.

6.2.3 When traveling, the deviation distance shall not be greater than 700 mm every 20 m.

6.2.4 The traveling speed shall not be less than 1 km/h but not greater than 5 km/h (the specific traveling speed of each type of drilling rigs shall be provided in the design).

6.2.5 The climbing capability shall be greater than 14°.

6.3 Reduction Box

6.3.1 The manufacturing accuracy of gears shall not be lower than the requirements of Level 8 in GB/T 10095.1 ~ 10095.2.

6.3.2 The temperature rise shall not be greater than 30 °C.

6.3.3 The sealing shall be good.

6.4 Slewing Mechanism

6.4.1 The manufacturing accuracy of gears of the slewing mechanism cannot be lower than the requirements of Level 8 in GB/T 10095.1 ~ 10095.2.

6.4.2 After assembly, the slewing reducer must undergo a 30-min no-load test in the forward and reverse directions. The temperature rise shall not exceed 30 °C and there shall be no abnormal noise.

6.4.3 The cleanliness value of the slewing reducer shall not be greater than 960 mg.

6.4.4 After the slewing mechanism operates 5 times in the entire stroke on the carriage, it shall flexibly and smoothly move, without crawling or blocking. In addition, it shall be located in the center of the drill frame, and the eccentricity shall be less than 1 mm.

6.5 The gas and water pipeline systems shall be correctly installed, properly sealed, and free of air and water leaks.

6.6 Hydraulic System

6.6.1 The hydraulic system shall have no oil leakage and shall have protective devices to prevent dust and other impurities from entering.

6.6.2 Each assembly of each hose shall be connected in accordance with the system drawing, and no twisting or folding is allowed during assembly.

6.6.3 The cleanliness of the hydraulic system: the impurity content in every 100 g of hydraulic

oil shall not exceed 10 mg.

6.6.4 The 6 h movement of the piston rod of the support arm hydraulic cylinder shall not be greater than 4 mm.

6.7 Electrical System

6.7.1 The electrical system shall be free of poor contacts, errors and electric leakage.

6.7.2 The mechanical support of the electrical device shall be able to eliminate or buffer the acting forces during movement.

6.7.3 On drilling rigs powered by an external power supply, a cable entry device shall be installed.

6.7.4 The grid voltage used by the drilling rig shall comply with the stipulations of GB/T 156.

6.7.5 The motor shall have protective measures against rain, moisture, dust and electric leakage.

6.8 Control Mechanisms

The control board in the driver's cab shall be equipped with control instruments for drilling rig operation. Each control system shall be correctly installed and operated, and be flexibly, safely and reliably used.

6.9 Propulsion Mechanism

6.9.1 For the propulsion mechanism of the drilling rig, one propulsion stroke shall comply with the design requirements of the drilling rig.

6.9.2 The propulsion force of the propulsion mechanism shall comply with the design requirements of the drilling rig.

6.10 The drilling rig shall have a flexible, reliable and accuracy device for connecting and unloading the drill rod.

6.11 The assembly of the drilling machinery shall comply with the provisions of Article 3 in JB/T 7165.

6.12 The machining of all parts of the drilling machinery (except for the specific dimensions and tolerances provided in the drawings) shall comply with the provisions of JB/T 7164.

6.13 The heat treatment of the parts of the drilling machinery shall comply with the stipulations of JB/T 7161.

6.14 The quality of welding parts of the drilling machinery shall comply with the stipulations of JB/T 7167.

6.15 Paint

7.2.4.2 Raise the pressure of the hydraulic system to 1.5 times the rated pressure (when the rated pressure is less than or equal to 16 MPa) or 1.25 times the rated pressure (when the rated pressure is greater than 16 MPa); maintain the pressure for 20 minutes.

7.2.5 Cleanliness inspection of slewing reduction box

Drain the oil in the tank, filter it, then, pour the gasoline into the tank, use a brush to clean all parts, and drain out the cleaning gasoline. Use a sieve mesh with a basic mesh size of 0.075 mm (200 mesh) to filter it, dry the filtered dirt, together with the sieve, in a drying box (at a temperature of 120 °C, for a duration of 1 hour). Then, cool it in a desiccant for 20 minutes and weigh it.

7.2.6 Cleanliness of hydraulic system

Drain the oil from the tank and filter it. Use a sieve mesh with basic mesh size of 0.075 mm (200 mesh) to filter it, dry the filtered dirt, together with the sieve, in a drying box (at a temperature of 120 °C, for a duration of 1 hour). Then, cool it in a desiccant for 20 minutes and weigh it.

7.2.7 Place the drill arm and propeller flat, move the rock drill to the frontmost end of the propeller, after parking for 6 hours, check the change in the length of the arm cylinder piston rod.

7.2.8 Propulsion test

Use an electronic dynamometer to carry out the test, without installing the drill rod and impactor, when the drill frame is vertical to the horizontal plane.

7.2.9 Brake reliability test

On a specified slope, the braking distance when driving uphill or downhill.

7.2.10 Complete-machine reliability test

7.2.10.1 The cumulative trouble-free operation time of the complete machine shall not be less than 100 hours. The reliability test may be combined with the production test or separately conducted.

7.2.10.2 For complete machines that undergo the reliability test in conjunction with the production test, calculate based on the cumulative time of the production test of 100 hours, general adjustments and maintenance are allowed during this period, and the cumulative time shall not exceed 2 hours.

7.2.10.3 During the test, no malfunction shall occur, and the cumulative time for adjustments and minor repairs shall not exceed 1 hour.

8 Inspection Rules

8.1 Exit-factory Inspection

8.1.1 The exit-factory inspection items are:

a) Electrical system;

b) Hydraulic system;

c) Air circuit system;

d) Mechanical transmission system;

e) Complete machine performance.

8.1.2 Each drilling rig must be inspected one by one at the manufacturer. Only by passing the inspection can it be allowed to exit the factory. In addition, it shall be accompanied by documents proving the conformance of quality.

8.2 Type Inspection

8.2.1 Type inspection is a comprehensive inspection, which is conducted every 3 years during normal production. Under one of the following circumstances, type inspection shall be conducted:

a) During trial production and appraisal of new products (or transfer of old products to another factory for production);

b) When there are significant changes in structure, process or materials used;

c) When production resumes after a long period of suspension;

d) When the relevant national departments propose a request for type inspection.

8.2.2 Products for type inspection shall be randomly selected from the products that have passed the exit-factory inspection, and the sampling size shall be one set.

8.3 Determination Rules

8.3.1 During exit-factory inspection, if there are no more than 3 minor defects in appearance quality that do not affect the overall appearance, the product can be determined as qualified; products with disqualified assembly quality and performance can be allowed to exit the factory after repairs.

8.3.2 During type inspection, if there are disqualified performance parameters that are still disqualified after re-inspection, then, the product shall be determined as disqualified.

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