GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 73.120

J 77

GB 19815-2021

Replacing GB 19815-2005

Centrifuge -- Safety requirements

离心机 安全要求

Issued on: April 30, 2021 **Implemented on: May 01, 2022**

Issued by: State Administration for Market Regulation;
Standardization Administration of the People's Republic of China.

Table of Contents

Centrifuge -- Safety requirements

1 Scope

This Standard specifies the safety requirements for the design, manufacture, installation and use of various industrial centrifuges with metal drums (hereinafter referred to as centrifuges), as well as the inspection and determination methods of usage information and safety performance.

This Standard applies to all centrifuges for industrial purposes (including industrial dehydrators).

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 3766, *Hydraulic fluid power -- General rules and safety requirements for systems and their components*

GB 3836.1, *Explosive atmospheres -- Part 1: Equipment - General requirements*

GB/T 4774, *Terminology of filtration and separation*

GB/T 5226.1, *Electrical safety of machinery -- Electrical equipment of machines -- Part 1: General requirements*

GB/T 7932, *Pneumatic fluid power -- General rules and safety requirements for systems and their components*

GB/T 8196, *Safety of machinery -- Guards -- General requirements for the design and construction of fixed and movable guards*

GB/T 9969, *General principles for preparation of instructions for use of industrial products*

GB/T 10894, *Determination method of separation machinery noise*

GB/T 12265.3, *Safety of machinery. Minimum gaps to avoid crushing of parts of the human body*

GB 12476.1, *Electrical apparatus for use in the presence of combustible dust -- Part*

4.2.1.1 Structural design errors or irrationality, such as insufficient strength and stiffness at the connection points of various structural components, poor stability leading to the failure of structural components or connection points; Or the lack of reliable anti-loosening measures at the fastening parts of the rotating components may lead to fastening failure.

4.2.1.2 The strength calculation of the centrifuge drum does not comply with the provisions of GB/T 28695.

4.2.1.3 The materials used in the design of the centrifuge do not meet the requirements of the operating conditions.

4.2.1.4 The exposed moving parts of the centrifuge lack effective protective devices or measures.

4.2.1.5 Hydraulic and pneumatic system design is unreasonable, without overload or pressure loss protection devices. There is no interlocking protection for related actions during operation.

4.2.1.6 The parts of the centrifuge that may cause leakage have not been effectively sealed, such as the closed centrifuge shell, hydraulic cylinder body flange, and pressure component pipeline connection parts.

4.2.1.7 The centrifuge is not equipped with a safety lifting device or the lifting device and lifting position are set improperly.

4.2.2 Manufacturing factors

4.2.2.1 The chemical composition and mechanical properties of the materials used in centrifuge manufacturing do not meet the design requirements.

4.2.2.2 The welding parts of the centrifuge are not welded and inspected according to regulations, or the welding quality does not meet the design requirements.

4.2.2.3 Centrifugal casting and forging parts do not meet the design requirements or are not inspected according to regulations.

4.2.2.4 The manufacturing and processing accuracy of centrifuge components does not meet the design requirements. The assembly of components or the entire machine does not meet the design requirements.

4.2.2.5 The dynamic balance of the rotating components of the centrifuge does not meet the requirements of the product standard.

4.2.2.6 The centrifuge components that require process treatment do not meet the requirements.

4.2.2.7 The centrifuge can come into contact with parts with burrs, sharp corners, and

sharp edges.

4.2.2.8 The purchased parts of the centrifuge do not meet the design requirements, or the quality of the purchased parts does not meet the relevant standard requirements.

4.3 Electrical hazards

4.3.1 The electrical system design of the centrifuge is unreasonable and poses safety risks.

4.3.2 The purchased electrical equipment and components do not meet safety requirements.

4.3.3 Fail to take effective measures for electric shock, overload. There is insufficient alarm for faults.

4.4 Noise hazards

The centrifuge noise does not meet the requirements of the product standard.

4.5 Vibration hazards

4.5.1 The centrifuge does not have effective vibration reduction devices or measures. There is no vibration alarm or protection.

4.5.2 The vibration intensity of the centrifuge does not meet the requirements of the product standard.

4.5.3 Resonance generated by centrifuge operation.

4.6 Temperature and temperature rise hazards

4.6.1 Hazards caused by high temperature and temperature rise of centrifuge main bearings and other components.

4.6.2 Hazards caused by high oil temperature and oil temperature rise in hydraulic systems.

4.7 Material and material hazards

4.7.1 Hazards caused by contact with toxic or harmful materials.

4.7.2 Hazards caused by toxic or corrosive materials.

4.7.3 Hazards such as poisoning, allergies, burns, and explosions caused by volatile,

motion that are easily accessible to the operator (such as gears, shafts, transmission belts, etc.), or between moving and stationary parts. Protective devices or restrictive measures shall not pose additional hazards. The protective device shall comply with the requirements of GB/T 8196. The restrictive measures shall comply with the requirements of GB/T 23821 and GB/T 12265.3.

5.2.1.5 The safety requirements of hydraulic systems shall comply with the requirements of GB/T 3766.

5.2.1.6 The safety requirements of pneumatic systems shall comply with the requirements of GB/T 7932.

5.2.1.7 The sealing parts of centrifuges that may pose a danger shall undergo a tightness test. The airtightness shall meet the design requirements.

5.2.1.8 Centrifugal machines and components that need to be lifted shall be equipped with lifting devices unless their shape is suitable for lifting.

5.2.2 Manufacturing requirements

5.2.2.1 The mechanical properties and chemical composition of the main components of the centrifuge (such as the drum, spindle, etc.) shall meet the design requirements. There shall be a material quality certificate from the material manufacturer. The centrifuge manufacturing unit shall inspect the materials according to this certificate.

5.2.2.2 Centrifugal casting drum shall comply with the requirements of JB/T 11874.

5.2.2.3 The forged and welded parts of the centrifuge shall meet the design requirements and be inspected according to regulations. The inspection method shall comply with the requirements of JB/T 9095 and JB/T 10411.

5.2.2.4 Drum welding shall be carried out by welders holding qualification certificates issued by legal departments.

5.2.2.5 The weld seam of the centrifuge drum liquid blocking plate shall be staggered with the longitudinal weld seam of the drum. The opening position of the drum shall avoid longitudinal welds.

5.2.2.6 The rotating components of the centrifuge shall be balanced according to the design requirements and the provisions of GB/T 28696. The balance result shall meet the requirements of the product standard.

5.2.2.7 Centrifugal casting shall meet the design requirements and be inspected according to relevant standards.

5.2.2.8 The manufacturing and processing accuracy of centrifuge components shall meet the design requirements. The assembly of components or the entire machine shall meet the design requirements.

5.2.2.9 The main components of the centrifuge for process treatment shall meet the design requirements.

5.2.2.10 The materials used to manufacture the main components of the centrifuge are allowed to be replaced with materials with the same or better performance, but must be approved by the design department.

5.2.2.11 The parts of the centrifuge that can be touched by personnel shall be free of burrs, sharp edges, and sharp corners.

5.2.2.12 The purchased parts of the centrifuge shall be of qualified quality and meet the design requirements.

5.3 Safety requirements for electrical systems

5.3.1 For parameters such as extreme positions, temperature, pressure, vibration, etc. that may cause danger, the electrical system shall have necessary automatic monitoring and alarm functions. When a certain out of limit fault occurs, work shall be reliably stopped, and work shall not be started until the fault is resolved.

5.3.2 The electrical system of the centrifuge shall be designed to prevent electrical hazards in accordance with GB/T 5226.1.

5.3.3 The associated actions of the centrifuge electrical control system shall be interlocked. It shall have the function of preventing unexpected faults and/or dangerous events caused by mis-operation.

5.3.4 The power wiring of the motor driving the moving parts in the centrifuge shall ensure that its movement direction is consistent with the requirements of the movement direction signs or warning signs.

5.3.5 The electrical system shall have an emergency stop device. The emergency stop device shall be able to stop all operations and movements that generate danger. Resetting the emergency stop device shall not cause any dangerous situations. The requirements and design principles of emergency stop devices shall comply with the requirements of GB/T 16754.

The insulation resistance between the centrifuge power circuit wires and the protective grounding shall meet the design requirements.

5.3.7 The electrical equipment used at the centrifuge work site shall comply with the provisions of GB 3836.1. The explosion-proof and protection level shall meet the design requirements and shall have a certificate of conformity issued by the relevant department.

5.3.8 The electric valves, hydraulic and pneumatic instrument components, sensors, instrument control cabinets, instruments, etc. used in flammable and explosive sites

Centrifuges shall not be made of toxic or harmful materials.

5.7.2 Toxic or corrosive materials

When centrifuges are used for the treatment of toxic or corrosive materials, the materials in contact with the materials shall be able to withstand material corrosion and shall have isolation and protective devices or measures.

5.7.3 Flammable and explosive materials

5.7.3.1 When using a centrifuge to process volatile, flammable, or explosive materials, it shall meet the sealing requirements. Sealed chambers in contact with flammable and explosive materials shall provide reliable and stable inert gas protection. When the inert gas protection fails, it shall have alarm and shutdown functions.

5.7.3.2 The centrifuge shall be equipped with a reliable grounding device and have clear grounding signs.

5.8 Other safety requirements

5.8.1 The safety devices and measures of all centrifuges shall not pose any new danger to personnel and equipment.

5.8.2 The installation of centrifuges shall meet the design requirements.

5.9 Archive

5.9.1 During the manufacturing process of centrifuges, product files and technical files shall be established. The archives are kept in the manufacturing plant according to the design life of the machine.

5.9.2 The product file shall include, in part or in whole, but not limited to the following contents: quality certificate of drum and spindle materials, physical and chemical analysis report, heat treatment record, non-destructive testing report, radiographic film, inspection report, dynamic balance report, drum repair record, drum intergranular corrosion report, and relevant documents of major purchased parts. Technical files shall include, in part or in whole, but not limited to, the following contents: calculation sheets, design drawings, drum strength calculation reports, welding process evaluation reports, processing techniques, etc.

5.9.3 Product files shall be archived one by one according to the product number. Technical archives can be centrally archived. When there is a significant change in the material being processed or the material of the drum, the centrifuge shall undergo a new strength check and a calculation sheet shall be formed and archived.

6 Use information

6.1 Basic requirements

6.1.1 Centrifuge manufacturers shall provide detailed usage information while providing centrifuge products, so that users can safely install, use, and maintain the machine according to this information.

6.1.2 The usage information shall be provided in the form of a logo and user manual.

6.2 Marks

6.2.1 The marks shall be provided in the form of product labels, rotation direction signs, warning signs, etc. The marks shall be written and marked in Chinese in a prominent location. The terminology used in the marks shall comply with the provisions of GB/T 4774. The text and pattern of the marks shall be clear and comply with the provisions of GB/T 18209.2.

6.2.2 The product label of each centrifuge shall indicate the rated technical parameters for normal operation of the centrifuge in accordance with the corresponding product standards. The technical parameters provided in the label shall be accurate and truthful.

6.2.3 The centrifuge shall have a permanent drum rotation direction label fixed.

6.2.4 To avoid other residual risks, warning signs shall be set up at corresponding locations.

6.3 User manual

6.3.1 The writing of the user manual shall comply with the provisions of GB/T 9969. The user manual shall be written in Chinese. The terminology used in the user manual shall comply with the provisions of GB/T 4774.

6.3.2 The manufacturer shall provide user manuals that can correctly guide users in installation, use, maintenance, and other aspects. The user manual shall clearly specify the intended use of the centrifuge and the restrictions on materials. It shall include all instructions to ensure safe and correct installation, use, and maintenance of the centrifuge. Users shall be required to use the machine reasonably according to the instructions. Appropriate warnings shall be given regarding the potential dangers of using the centrifuge in other ways without following the requirements in the instructions. The manufacturer must determine the overhaul period of the machine based on the usage conditions provided by the user.

6.3.3 The user manual for the centrifuge shall include:

- Monitoring and recording during operation;

- Modes and methods of shutdown (especially emergency shutdown);

- Operating procedures, methods, precautions, and potential mis-operations and preventive measures during startup and operation;

- Information about risks that cannot be eliminated by designers through the adoption of security measures;

e) Repair information, such as:

- Fault analysis;

- Procedures and methods for handling malfunctions;

- Nature and frequency of inspections;

- Maintenance instructions that require specialized technical knowledge and special skills personnel to perform.

f) Security information, such as:

- Information that may pose a danger shall be given in the form of a warning.

g) Information on stopping operation, dismantling, and scrapping due to safety reasons.

h) Information about centrifuge operation and maintenance, such as operating sequence, replacement cycle of vulnerable parts, lubrication cycle, etc.

i) In the operating manual, safety requirements and measures for centrifuge operation and maintenance shall be clearly stated in accordance with the requirements of Chapter 8.

7 Determination of safety performance

7.1 Sampling

7.1.1 The products subject to sampling inspection shall be those sold in the market, have the conditions for mass production, and have passed the manufacturer's self-inspection.

7.1.2 Sampling adopts random sampling method.

7.1.3 The products subject to sampling inspection shall be those that have been completed for no more than one year.

8.3 The centrifuge is only allowed to be operated and maintained by personnel designated by the user who have received technical training. The machine shall be used and maintained correctly in accordance with the relevant sections of the manufacturer's instructions.

8.4 The centrifuge shall be regularly inspected to ensure that its functions, important components, and safety protection devices are in normal working condition. The centrifuge shall have the correct small, medium, and major maintenance cycles and strictly follow them to operate under normal conditions.

8.5 Operators shall be proficient in operating procedures such as starting, stopping, and emergency stopping of centrifuges. Do not engage in rough handling (such as using a shovel to scoop materials during high-speed rotation, overloading operation, etc.). Do not operate the centrifuge at excessive speed or load.

8.6 After discovering abnormal situations, operators shall take necessary measures. Stop the machine immediately if it is ineffective. Restart after confirming safety. Necessary preventive measures shall be taken when adjusting, maintaining, or troubleshooting.

8.7 When the operator needs to replace parts of the centrifuge (such as filter screen, filter cloth, etc.), they shall ensure that the centrifuge will not be started and use warning signs such as "under maintenance".

8.8 When the rotating parts such as the centrifuge drum and main shaft, as well as other important components, corrode, wear out, or experience abnormal vibration of the centrifuge, they shall be replaced or repaired in a timely manner. Unsafe emergency measures such as surface repair welding shall not be used.

8.9 The integrity of the centrifuge shall be ensured. Without the consent of the machine manufacturer, it is not allowed to dismantle, change parts or add or remove accessories at will.

This is an excerpt of the PDF (Some pages are marked off intentionally)

------ The End ------