GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 13.240

CCS J 16

GB/T 12243-2021

Replacing GB/T 12243-2005

Spring loaded safety valve

弹簧直接载荷式安全阀

Issued on: April 30, 2021 **Implemented on: November 01, 2021**

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

Table of Contents

Spring loaded safety valve

1 Scope

This document specifies the design, performance, test and inspection, appearance, mark and lead seal, protection, storage and transportation for spring loaded safety valves (hereinafter referred to as safety valves).

This document is applicable to safety valves for steam with a set pressure of 0.1MPa~42.0MPa, and flow passage diameters greater than or equal to 15mm, as well as safety valves for gas and liquids with a diameter greater than or equal to 7mm.

This document is applicable to safety valves whose discharge medium temperature is not lower than -29°C.

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 9440, *Malleable iron castings*

GB/T 12224, *General requirements for industrial steel valves*

GB/T 12225, *General purpose industrial valves - Specification of copper alloy castings*

GB/T 12227, *General purpose industrial valve - Specification of spheroidal graphite iron castings*

GB/T 12228, *General purpose industrial valves - Specification of carbon steel forgings*

GB/T 12229, *General purpose industrial valves - Specification of spheroidal graphite iron castings*

GB/T 12230, *General purpose industrial valves - Specification of stainless-steel castings*

GB/T 12241, *Safety valves - General requirements*

GB/T 12242, *Pressure relief devices - Performance test code*

GB/T 23935, *Design of cylindrical helical springs*

JB/T 2203, *Center-to-face dimensions of spring loaded safety valve*

JB/T 5263, *Specification for steel casting for power station valves*

JB/T 6439, *Methods of magnetic examination for valves*

JB/T 6440-2008, *Methods of radiographic examination for steel castings valves*

JB/T 6902, *Methods for liquid penetrant examination of valves*

JB/T 7367, *Magnetic particle inspection for helical compression springs*

NB/T 47013.2-2015, *Nondestructive testing of pressure equipment - Part 2: Radiographic testing*

NB/T 47013.3-2015, *Nondestructive testing of pressure equipment - Part 3: Ultrasonic testing*

NB/T 47013.5-2015, *Nondestructive testing of pressure equipment - Part 5: Penetrant testing*

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 12241 as well as the followings apply.

3.1 full-lift safety valve

A safety valve that the actual discharge area is the flow channel area.

3.2 low-lift safety valve

A safety valve that the actual discharge area is the curtain area.

3.3 discharge area

The smallest cross-sectional area in the fluid passage when the valve is vented.

NOTE: The minimum cross-sectional area determines the flow through the valve.

3.4 flow-rating pressure

The static pressure at the inlet of the valve when measuring the displacement of the safety valve.

NOTE: Static pressure is the absolute pressure of the sum of the set pressure of the safety valve and the excess pressure.

4 Design

4.1 General

4.1.1 The design of the safety valve shall comply with the provisions of GB/T 12241.

4.1.2 The applicable temperature range of the safety valve shall be determined according to its structure (such as spring heat insulation and cold insulation), material, medium working characteristics, and temperature change limit value during discharge. The safety valve shall work normally within the marked temperature range.

4.1.3 When the safety valve used for compressible gas medium is in the discharge state, due to the phenomenon of condensation and frost due to temperature drop, the suitability of its structure and materials shall be fully considered. Prevent jamming and other phenomena during the action of the disc.

4.1.4 It shall be designed and manufactured to prevent the discharged medium from directly eroding the spring. For safety valves with a working medium temperature greater than 235°C, consideration shall be given to reducing the influence of the medium temperature on the spring.

4.1.5 The mechanism for adjusting spring compression shall be provided with an anti-loosening locking device.

4.1.6 Safety valves for steam and high-temperature hot water boilers shall be equipped with lifting mechanisms. When the medium pressure reaches more than 75% of the set pressure, the lifting mechanism can be used to lift the disc. When the temperature of hot water is higher than 93°C, it is not allowed to directly use the lifting mechanism to lift the disc. The lifting mechanism shall not have any hindrance to the action of the safety valve.

4.1.7 Safety valves for toxic and flammable media shall be closed safety valves.

4.1.8 For safety valves with additional back pressure or higher discharge back pressure, it shall be considered to set up a back pressure balancing mechanism according to the change and size of the back pressure.

4.2 End connection

The end connection of the safety valve shall be in accordance with the provisions of GB/T 12241. Safety valves with threaded end connections shall be provided with wrench flats for easy installation.

is discharged. The flange size of the outlet end shall not be smaller than the flange size of the inlet end.

4.4.4 The flange shall be integrally cast or forged with the valve body or welded or threaded to connect the flange. Flanges for welded connections shall be butt welded. The welding requirements are in accordance with the provisions of GB/T 12224.

4.4.5 To prevent liquid from accumulating, a discharge screw hole shall be provided at a position lower than the sealing surface of the valve seat.

4.5 Valve seat and disc

4.5.1 The material of the valve seat and disc shall be shock-resistant and medium-resistant. Cast iron materials shall not be used.

4.5.2 The sealing secondary material can be the material of the valve seat and the disc body. It can also be welded with another alloy material, or inlaid with non-metallic elastic sealing material. When the sealing surface of the valve seat or disc is welded with alloy materials, the thickness of the hardened layer after processing shall not be less than 2mm. When inlaid non-metallic elastic sealing material is used, there shall be a protective structure for the non-metallic sealing material, so as to prevent the non-metallic material from being blown out and damaged, affecting the seal.

4.5.3 The sealing surface of the valve seat and disc shall be in the form of a plane. When the tapered sealing surface is used, the angle between the sealing surface and the valve axis is preferably 45°.

4.6 Spring

4.6.1 The requirements for springs shall not be lower than those specified in GB/T 12241. When 4.6.2~4.6.15 is inconsistent with the requirements stipulated in GB/T 12241, the regulations in 4.6.2~4.6.15 shall be followed.

4.6.2 The slenderness ratio (ratio of free height to middle diameter) of the spring shall be less than 3.7.

4.6.3 Both ends of the spring shall have a support plane greater than or equal to 3/4 circle. The end of the supporting ring shall be tight with the working ring. The deviation of the perpendicularity of the spring axis to the support planes at both ends shall not be greater than 1.7mm per 100mm length.

4.6.4 The winding ratio (spring index) can be selected in the range of 3~8.

4.6.5 The limit deviation of the free height of the spring is as specified in Table 2. According to the design requirements, it is allowed to specify the limit deviation of the asymmetric distribution of the free height. However, its tolerance value shall comply

maximum working pressure, the maximum and minimum temperature during discharge, so as to ensure reliable operation.

4.7.1.2 Steel safety valve body material is according to the provisions of GB/T 12228, GB/T 12229, GB/T 12230, JB/T 5263. The operating pressure and temperature limits of materials are in accordance with the provisions of GB/T 12224.

4.7.1.3 Malleable cast iron valve body material is according to the provisions of GB/T 9440. Malleable cast iron is limited to nominal pressure not greater than PN16. The operating temperature range is -10°C~200°C.

4.7.1.4 Ductile iron valve body material is according to the provisions of GB/T 12227. Ductile iron is limited to nominal pressure not greater than PN25. The operating temperature range is -10°C~300°C.

4.7.1.5 Copper alloy casting valve body material is according to the provisions of GB/T 12225. Copper alloy castings are limited to nominal pressure not greater than PN25. The operating temperature range does not exceed 120°C. Copper alloy rods or forgings can be used for nominal pressure PN50.

4.7.1.6 When using toxic, harmful, flammable and explosive media, the pressure-bearing shell material is not allowed to use iron materials.

4.7.2 Valve seat and disc

4.7.2.1 The corrosion resistance of the valve seat and disc body material shall not be lower than that of the valve body material. Iron materials are not allowed. It shall be suitable for the discharge condition of the safety valve.

4.7.2.2 Safety valve seats for steam and saturated water with nominal pressure greater than or equal to 10MPa and operating temperature greater than 370°C shall be forged or rolled materials.

4.7.3 Guide sleeve

The material of the guide sleeve shall have good wear resistance and corrosion resistance. It shall be suitable for the discharge condition of the safety valve.

4.7.4 Spring

The material of the spring shall be selected according to GB/T 23935 and meet the requirements of the corresponding standards.

4.8 Non-destructive testing

The non-destructive testing of safety valves shall be in accordance with the provisions in Annex A.

overflowing. Raise the inlet pressure to the sealing test pressure. Collect and measure the amount of water spilled under the test pressure, that is, the amount of leakage. Continue for at least 1min.

6.4.5 Action performance and displacement

The action performance test and displacement performance test of safety valve comply with the provisions of GB/T 12241 and GB/T 12242.

7 Appearance

After passing the test and before leaving the factory, the appearance of the safety valve shall be visually inspected. At least the following requirements shall be met:

a) The marks and nameplates shall be properly marked;

b) The adjustment part of the safety valve shall be locked and sealed;

c) The carbon steel and alloy steel safety valves shall be subjected to surface protection treatment according to the manufacturer's regulations or contract requirements;

d) The safety valve shall have the necessary protection;

e) Check whether there is rust on the outer surface and inner cavity of the safety valve;

f) Castings shall be free from harmful defects such as trachoma, burrs, sticky sand, sand inclusions, cracks. Forgings shall be free of defects such as cracks;

g) The corners of the outer surface processing parts shall be chamfered or rounded.

8 Marks and lead seals

8.1 The nameplate of the safety valve or the outer surface of the safety valve shall at least have the following marking information:

- Safety valve manufacturing license number and mark;

- Manufacturer name (or trademark) and product name, model;

- Date of manufacture and its product number;

- Nominal size and runner diameter (or runner area);

- Nominal pressure and set pressure;

- Excess pressure;

- Opening height;

- Extreme working temperature;

- Indication of the rated displacement coefficient of the reference fluid (G for air, S for steam, and L for water) or the guaranteed rated displacement for a certain fluid;

- Backpressure (when there is a backpressure requirement).

8.2 The lead seal of the safety valve shall comply with the provisions of GB/T 12241.

9 Protection and storage

9.1 Before the safety valve leaves the factory, all external surfaces except the flange surface shall be painted with paint (except for corrosion-resistant materials). The flange faces shall be oil-sealed to prevent corrosion.

9.2 Threaded holes shall be plugged with protective plugs. Temporary plugs shall be clearly distinguishable from permanent metal plugs.

9.3 To prevent damage to the flange surface during shipment and to prevent the entry of foreign debris, the inlet and outlet flanges of the safety valve shall be protected by plugging covers.

9.4 The safety valve shall be sealed and packaged. During transportation and storage, it shall always be kept upright and not shaken. It is strictly forbidden to push down and carry.

9.5 The safety valve shall be stored upright in a dry room. The inlet and outlet as well as the ventilation holes shall be sealed with plugging caps.

9.6 The ambient atmosphere shall not contain harmful gases that may cause corrosion of the safety valve.

Annex A

(normative)

Non-destructive testing

A.1 General

For safety valves with a nominal pressure greater than or equal to 15MPa (Class 900) and an operating temperature greater than 370°C, with welded inlets, or after an agreement is reached between the purchaser and the safety valve manufacturer, non-destructive testing shall be carried out in accordance with A.2~A.7.

A.2 Solder connection

A.2.1 For safety valves connected by welding of castings, the requirements for the welding groove of the butt weld on the inlet side are as follows.

a) Radiographic testing shall be carried out in accordance with the provisions of JB/T 6440-2008. The result shall meet the requirements of 6.1 and 6.2 of JB/T 6440-2008. The effective radiographic range of the groove is 1.5 times the pipe thickness or 50mm from the surface of the butt-welding end, whichever is greater.

b) After the groove processing is completed, liquid penetrant or magnetic particle inspection shall be carried out. The result shall meet the following requirements:

1) The liquid penetrant test result shall not be lower than the level 2 specified in JB/T 6902;

2) The test result of magnetic particle flaw detection shall not be lower than the level 2 specified in JB/T 6439.

A.2.2 For safety valves with welding connections of forgings or rolled parts, the welding groove at the butt-welding connection on the inlet side shall comply with the provisions of A.2.1b).

A.3 Weld seam of welded valve seat

When the valve seat is mounted to the valve body by welding, the weld bevel face shall be tested for liquid penetration. The result shall meet the requirements of A.2.1b). After welding, the weld shall be tested for liquid penetration according to the regulations of NB/T 47013.5-2015. The result shall meet the requirements of level I.

A.4 Valve seat and disc sealing surface

The sealing surface of the valve seat and disc shall be tested for liquid penetration

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

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