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Pilot operated safety valves

先导式安全阀

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Foreword

This document was issued on 7 September 2023 by the State Administration for Market Regulation; Standardization Administration of the PRC and takes effect on 1 April 2024.

It is a GB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

1 Scope

GB/T 28778-2023 covers pilot operated safety valves, in which a pilot senses system pressure and drives the main valve instead of a spring loading the main disc directly. It runs from design - the general requirements, the main parts and assemblies, the end connection, the spring and the materials - through the tests a valve passes before it leaves the works: the shell hydraulic test and the shell air pressure test, the adjustment of the cold test differential pressure, the seat sealing test and the airtightness test. Type testing then covers motion performance, the discharge test, and the determination and rating of the coefficient of discharge, which in turn feeds the determination of discharge capacity and the calculation of rated discharge capacity and flow area. Marking and sealing close the document. That order matters because a safety valve is the last barrier when a vessel or a line goes over pressure: one that opens late, chatters, or passes less flow than the sizing calculation assumed leaves the system exposed, a seat that leaks in normal service wastes product and cuts itself, and an unsealed adjustment lets set pressure be moved in the field with nothing left to show it. Written for valve makers, for pressure vessel and pipeline designers sizing relief, for test houses and for inspection bodies.

This document specifies the design, material and structural requirements, ex-factory tests, type tests, determination of discharge, calculation of rated displacement and flow area, as well as marking and sealing of pilot operated safety valves.

This document applies to pilot operated safety valves with set pressure not less than 0.1 MPa and flow channel diameter not less than 4 mm.

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 version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB/T 1047, Pipework components - Definition and selection of nominal size

GB/T 12241, Safety valves - General requirements (GB/T 12241-2021, ISO 4126-1:2013, MOD)

GB/T 36588, Safety devices for protection against excessive pressure - Common data (GB/T 36588-2018, ISO 4126-7:2013, MOD)

3 Terms and definitions

Terms and definitions determined by GB/T 1047 and GB/T 12241, as well as the following, are applicable to this document.

3.1

pilot operated safety valve

A safety valve that is driven or controlled by discharging medium from a pilot valve.

Note: The pilot valve controls the action of the main valve according to the pressure of the fluid medium. When the medium pressure that keeps the main valve closed decreases, the pilot safety valve will open. When the medium pressure closes the pilot valve again, the pilot operated safety valve will close.

3.2

5 Design

5.1 General requirements

5.1.1 The design and structure of the pilot operated safety valve shall comply with the requirements of GB/T 12241.

5.1.2 A guiding mechanism shall be designed to ensure the reliability of motion and sealing.

5.1.3 The valve seat and valve body of the main valve can be integral or separate. The separate valve seat shall be fixed on the valve body and shall not become loose when the valve is opened or closed.

5.1.4 All external adjustment mechanisms shall be locked or sealed to prevent or facilitate the detection of unauthorized adjustment of the pilot operated safety valve.

5.1.5 For main valves with limited opening height, an opening height limit device shall be installed. The device shall not affect the action of the main valve. If the opening

height limit device is adjustable, the manufacturer shall fix or seal it before shipment.

The opening height of the valve shall not be less than 1 mm.

5.1.6 For pilot operated safety valves used with toxic or flammable media, the media shall be discharged to a safe place.

5.1.7 A drain connection shall be provided at the lowest position of the main valve where liquid may accumulate in the valve body, unless other measures are taken.

5.1.8 The design stress of pressure-bearing parts shall comply with the requirements of relevant standards.

Note: Relevant standards include GB/T 12224, etc.

5.1.9 The materials of guide surfaces (such as guide sleeves, valve discs, valve disc seats, and valve stems) shall be corrosion-resistant, wear-resistant, and anti-bite.

5.1.10 In the event of foreseeable damage to the connections of various components, the discharge capacity of the pilot operated safety valve shall reach the rated discharge capacity when the pressure of the protected equipment is less than 1.1 times the maximum allowable pressure.

5.1.11 If the additional back pressure is higher than the pressure at the main valve inlet, measures shall be taken to prevent the medium from flowing back.

5.1.12 In certain circumstances, an opening device shall be provided or the pilot valve shall be applied with external pressure to verify whether important operating parts can move freely.

Avoid using air or other gases for shell testing. However, air or other suitable gases can be used instead of hydraulic pressure testing for shell pressure testing in the following cases:

- a) Pilot operated safety valves that are not suitable for filling with liquids in terms of design and structure;
- b) Pilot operated safety valve not allowed to be used in conditions where any trace of water is present.

The test pressure, test duration and acceptance criteria shall be as specified in 6.3.