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Bursting disc safety devices - Part 4: Type test

爆破片安全装置 第4部分：型式试验

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Foreword Foreword

The foreword states that annex A and annex B of this part are recommended and that all the remaining provisions are mandatory, and that the part was drafted according to the rules of GB/T 1.1-2009.

GB 567, Bursting disc safety devices, is divided into four parts: Part 1, Basic requirements; Part 2, Application, selection and installation; Part 3, Classification and installation dimensions; Part 4, Type test. This document is Part 4.

The part was proposed by and is under the administration of the National Technical Committee on Boilers and Pressure Vessels of Standardization (SAC/TC 262).

1 Scope

1.1 This part of GB 567 lays down, for the burst pressure testing, the flow capacity testing, the fatigue testing and the flow resistance testing carried out as type tests on bursting disc safety devices, the technical requirements covering the test principle and method, the test apparatus and instruments, the test conditions and test preparation, the test rules, the test steps, the processing of the test data and the calculation of the uncertainty of the test measurement result.

1.2 This part applies to bursting disc safety devices used on pressure vessels, pressure piping or other closed pressure-bearing equipment (hereinafter referred to as pressure-bearing equipment) to prevent overpressure or excessive vacuum. The bursting pressure of the bursting disc of the devices covered is not greater than 500 MPa and not

less than 0.001 MPa.

1.3 This part does not apply to bursting disc safety devices used on pressure-bearing equipment where the pressure may rise abruptly during operation and the reaction speed reaches detonation, nor to bursting disc safety devices for which national defence and military equipment has special requirements. A note explains that detonation is the phenomenon, fundamentally different from ordinary combustion and explosion, produced when the burning speed of a substance is extremely fast and reaches more than 1 000 m/s.

2 Normative references

The documents listed below are indispensable for the application of this document. For dated references, only the edition cited applies; for undated references, the latest edition, including all amendments, applies.

GB 567.1 Bursting disc safety devices - Part 1: Basic requirements; GB 567.2 Bursting disc safety devices - Part 2: Application, selection and installation; GB 567.3 Bursting disc safety devices - Part 3: Classification and installation dimensions; GB/T 2624 Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full; GB/T 21188 Measurement of gas flow by means of critical flow Venturi nozzles.

3 Terms and definitions

The terms and definitions given in GB 567.1 to GB 567.3 and the following apply to this document.

3.1 Burst pressure testing. The test that verifies the operating performance of a bursting disc safety device and determines its bursting pressure at a specified temperature.

3.2 Flow capacity testing. The test that determines the operating characteristics of a bursting disc safety device and measures its relieving capacity at the corresponding pressure.

3.3 Theoretical relieving (discharge) capacity. The calculated relieving capacity of an ideal nozzle having the net flow area of the bursting disc safety device, expressed as mass or volume per unit time.

3.4 Measured relieving (discharge) capacity. The relieving capacity of the bursting disc safety device measured at the relieving pressure, expressed as the mass or volume relieved per unit time.

3.5 Coefficient of discharge. The ratio of the measured relieving capacity to the theoretical relieving capacity.

3.6 Flow resistance factor. The dimensionless quantity expressing the velocity head (the

square of the velocity divided by twice the acceleration due to gravity) lost by the fluid passing through the bursting disc safety device.

4 Burst pressure testing

4.1 General requirement. The burst pressure test shall be carried out on a dedicated burst test apparatus; it may also be carried out on the test apparatus used for the flow capacity test or the flow resistance test, at the same time as that test.

4.2.1 The bursting disc safety device shall be installed on the burst test apparatus, and the volume of the test apparatus shall satisfy the test requirements.

4.2.2 The pressure of the test medium inside the burst test apparatus shall be raised at the specified rate of pressure rise until the bursting disc bursts, and the pressure inside the test apparatus at the instant the bursting disc ruptures shall be recorded.

4.2.3 The principle of the burst test apparatus for a bursting disc with a gaseous test medium is shown in figure 1, a schematic drawing of the apparatus showing the high-pressure air supply, the regulating valve, the pressure tapping, the optional temperature tapping and the bursting disc device on the test section.

4.2.4 The principle of the burst test apparatus for a bursting disc with a liquid test medium is shown in figure 2, a schematic drawing of a J-tube test rig showing the high-pressure air supply, the regulating valve, the vent valve, the water supply valve, the drain valve, the water column, the optional temperature tapping, the pressure tapping at the same height as the bursting disc device, the bursting disc device and the discharge pipe. The drawing is annotated to require that the flange dimensions be the same as the inlet dimensions of the bursting disc device, that a reducing pipe may be used for small sizes, and that the nominal size of the pipe be greater than or equal to the nominal size of the bursting disc device.

4.3.1 The burst test apparatus shall satisfy the following requirements: the nominal pipe diameter of the test section shall be not less than the nominal diameter of the bursting disc safety device and the volume shall be large enough to preserve the opening shape of the bursting disc; the connection between the burst test apparatus and the bursting disc safety device shall be firm and reliable and the holder shall be loaded evenly; the test pressure of the burst test apparatus shall have a reliable control method able to measure the static pressure of the test accurately, and the minimum rate of pressure rise shall be capable of being controlled steadily at not more than 0.001 MPa/s; the temperature of the burst test apparatus shall be adjustable and there shall be a reliable method and matching instruments for measuring the surface temperature of the bursting disc; the burst test apparatus shall be provided with appropriate and reliable safety protection facilities.

4.3.2 Temperature measurement. The test temperature of the bursting disc shall be measured with thermocouples, resistance thermometers or other methods able to measure the temperature of the bursting disc accurately. The resolution of the temperature

measuring instrument shall be not lower than 0.5 °C. The calibration shall include all the leads and the transmitters or instruments.

4.3.3 Pressure measurement. The pressure measuring point shall be as close as possible to the bursting disc under test, and pressure gauges or pressure transmitters of accuracy class not lower than 0.4 shall be used, with a range of 1.5 to 3 times the pressure value to be measured.

4.4.1 Test medium. The test medium shall in general be compressed air, water or hydraulic oil; for high-pressure or high-temperature conditions the test medium shall be nitrogen, hydraulic oil or high-temperature heat transfer oil.

4.4.2 Test preparation. The preparation work shall satisfy the following requirements: the burst test apparatus shall be checked and all its functions confirmed to be normal, and the accuracy and range of the measuring instruments and sensors shall match the parameters of the test disc; a preliminary test shall be run to make sure that the burst test apparatus can meet the test requirements and that the operators fully understand the details of the test.