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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 24921.1-2010

**Sizing, ion and installation of pressure relieving valves for
petrochemical industries -- Part 1: Sizing and se-lection**

(English Translation)

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1 Scope

This Part of GB/T 24921 specifies the terms and definitions, type characteristics and size determination of pressure relief valves for gas, steam, incompressible fluids and two-phase flow media for petrochemical industry.

This Part applies to pressure relief valves, which have a set pressure of not less than 0.1 MPa for petrochemical industry.

2 Normative references

The provisions in following documents become the provisions of this Part through reference in this Part of GB/T 24921. For the dated references, the subsequent amendments (excluding corrections) or revisions do not apply to this Part; however, parties who reach an agreement based on this Part are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

GB/T 12241 Safety valves - General requirements

GB/T 12242 Pressure relief devices - Performance test code

GB/T 24920 Steel pressure relief valves for petrochemical industries

3 Terms and definitions

The terms and definitions established in GB/T 12241 and GB/T 12242, as well as the following terms and definitions, shall apply to this Part.

3.1 Pressure relief valve

3.1.1

Pressure relief valve

It is a pressure relief device designed to reclose after returning to normal working conditions to prevent the medium from continuing to flow out.

5.1 General requirements

5.1.1

Reasonable consideration shall be given to various unexpected events that may cause overpressure, so as to determine the conditions required for overpressure protection and the size and type of pressure relief valve to be used.

5.1.2 Estimate the pressure generated by various unexpected events that lead to

overpressure and calculate the medium displacement required to be released. When calculating the displacement, the process flow chart, materials, pipelines, containers and equipment design specifications are required.

5.1.3 The release requirements under a series of operating conditions (including fire

conditions and non-fire conditions) that require overpressure protection shall be analyzed and confirmed in detail.

5.2 Effective area and effective displacement coefficient

5.2.1

In the corresponding calculation formulas of 5.6, 5.7, 5.8, the effective area and effective displacement coefficient are used to preliminarily determine the size of the pressure relief valve.

5.2.2

The effective area and effective displacement coefficient are only used for preliminary selection calculations and have no direct relationship with the design of specific valves. The actual flow area of the valve that finally meets the use requirements is usually larger than the standard effective area; the rated displacement coefficient is smaller than the effective displacement coefficient.

5.2.3

The rated displacement coefficient is determined by multiplying the average coefficient obtained by test verification by 0.9; its value is usually smaller than the effective displacement coefficient (especially for valves for steam media, wherein the effective displacement coefficient is 0.975).

5.2.4

When the pressure relief valve is selected, the actual flow area and rated displacement coefficient of the valve are used to verify the rated displacement of the valve. The verified displacement shall reach or exceed the displacement calculated by the corresponding formulas of 5.6, 5.7, 5.8, so as to verify whether the valve has sufficient displacement to meet the application requirements.

5.3 Back pressure

5.3.1

Back pressure can cause changes in opening pressure, reduction in flow rate,

5.4 Cold state test differential pressure

5.4.1

The cold state test differential pressure includes corrections for operating conditions such as temperature and back pressure.

5.4.2

When a conventional pressure relief valve is tested at a set pressure on a test bench at room temperature and used under high temperature working conditions or constant back pressure, the set pressure needs to be corrected.

5.4.3 For the adjustment of the cold state test differential pressure, for conventional

pressure relief valves under constant back pressure, the required set pressure shall be subtracted from the additional back pressure; for balanced pressure relief valves, the additional back pressure has no effect on the set pressure; for pressure relief valves with a discharge temperature exceeding 120 °C or below -59 °C, a temperature correction factor

for the set pressure is required for correction, the manufacturer shall be consulted.

5.5.1 Determination of discharge pressure

5.5.1.1

The allowable excess pressure shall be determined according to the accumulation pressure allowed by the relevant specifications; the allowable excess pressure shall be determined according to the different relationships between the set pressure and the maximum allowable working pressure of the system to be protected.

When the set pressure is equal to the maximum allowable working pressure, the allowable excess pressure is equal to the allowable accumulation pressure (see Figure

5).

5.5.1.2 When designing, the atmospheric pressure corresponding to the ground altitude

shall be taken into account.

5.5.1.3 The method for determining the discharge pressure of the pressure relief valve

for liquids is similar to that for the pressure relief valve for steam, or according to the requirements of the order contract.

5.5.1.4 According to the relationship between the pressure relief valve and the pressures

of the system to be protected, the restrictions on the maximum accumulation pressure and set pressure of the pressure relief valve are shown in Table 1.

Appendix A (Informative)

Example of size determination of gas media during critical flow

A.1 Working conditions

A.1.1 Due to operating errors, the required flow rate W of hydrocarbon mixture is 24260 kg/h.

A.1.2 The main components of hydrocarbon mixture are butane (C4) and pentane (C5); the molecular weight M of hydrocarbon mixture is 65.

A.1.3 The discharge temperature is 75 °C, that is, $(T = 273 + 75 = 348 \text{ K})$.

A.1.4 The set pressure of the pressure relief valve is 517 kPa (gauge pressure), which is