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

GB/T 17213.2-2017

Replacing GB/T 17213.2-2005

**Industrial-process control valves -- Part 2-1: Flow capacity --
Sizing equations for fluid flow under installed conditions**

工业过程控制阀 第2-1部分：流通能力 安装条件下流体流量的计算公式

(English Translation)

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Foreword

GB/T 17213 "industrial process control valve" is divided into the following sections.

- Part 1. Control valve terms and general principles (GB/T 17213.1);
- Part 2-1. Flow capacity Calculation formula for fluid flow rate under installation conditions (GB/T 17213.2);
- Part 2-3 - Test Procedures for Flow Capability (GB/T 17213.9);
- Part 2-4. Circulation capacity inherent flow characteristics and adjustable ratio (GB/T 17213.10);
- Part 2-5. Circulation capacity Fluid through the interstage recovery multi-stage control valve formula (GB/T 17213.17);
- Part 3-1. Dimensions Two-way ball-type through-flow control valve Flange end distance and two-way ball angle control valve Flange center to flange End surface spacing (GB/T

17213.3);

--- Part 3-2. Dimensionally Stroke control valve (excluding butterfly valves) End face distance (GB/T 17213.11);

--- Part 3-3. Dimension Butt welded two-way ball-type through control valve end (GB/T 17213.12);

--- Part 4. Tests and routine tests (GB/T 17213.4);

--- Part 5. Signs (GB/T 17213.5);

--- Part 6-1. Installation details of the positioner and control valve actuator connections. Mounting of the positioner on the linear actuator (GB/T 17213.6);

--- Part 6-2. Installation details of the positioner and control valve actuator connections. Mounting of the positioner on the angular travel actuator (GB/T 17213.13);

--- Part 7. Control valve data sheets (GB/T 17213.7);

--- Part 8-1. Noise considerations Noise generated by the flow of aerodynamic flow through control valves in the laboratory (GB/T 17213.8);

--- Part 8-2. Noise considerations Measurement of the noise generated by the flow of hydraulic fluid through control valves in the laboratory (GB/T 17213.14);

--- Part 8-3. Noise considerations Noise prediction methods for aerodynamic flow through control valves (GB/T 17213.15);

--- Part 8-4. Noise Considerations Noise Prediction Method for Flow of Liquid Flow Through Control Valves (GB/T 17213.16);

--- Part 9. Test procedures for step input response measurement (GB/T 17213.18).

This section GB/T 17213 Part 2-1.

This section drafted in accordance with GB/T 1.1-2009 given rules.

This Part Replaces GB/T 17213.2-2005 "Industrial Process Control Valves Part 2-1. Flow capacity Fluid flow under installation conditions Amount of formula ", and GB/T 17213.2-2005 compared to the main technical changes are as follows.

--- Modify the scope of application (see Chapter 1, 2005 edition Chapter 1);

--- Added the term "standard volume flow" (see 3.2);

--- Updated some symbols and their definitions (see Chapter 4, 2005 edition Chapter 5);

--- Modify the calculation formula of incompressible fluid (see Chapter 6, 2005 edition Chapter 6);

--- Modify the compressible fluid calculation formula (see Chapter 7, 2005 edition Chapter

7);

- Increasing the pipe geometry coefficient (see 8.1);
- Modify the calculation formula for estimating pipe geometry coefficient F_p using C instead of C_i (see 8.2, 2005 edition 8.1);
- Modify the calculation of the differential pressure ratio with attached pipe fittings xTP calculation, the use of C_i instead of C_i (see 8.4, 2005 Edition 8.6.2);
- The calculation of the liquid critical pressure ratio factor is placed in Chapter 6 (see 6.2.3, 2005 8.4);
- The ratio of specific heat, expansion coefficient, compression factor calculation is placed Chapter 7 (see 7.3, 7.4, 7.5, 2005 edition 8.7, 8.5, 8.8);
- The calculation of the Reynolds number coefficient FR is placed in Appendix A, A.7 (see Appendix A, 2005 version 8.2);
- Increasing the calculation of Reynolds number (see Chapter 9);
- Removed the original part of the appendix (see 2005 edition appendix);
- Increasing the non-turbulent formula (see Appendix A);
- Increasing the flow through the multi-stage control valve fluid flow formula (see Appendix B);
- Increasing the pipe coefficient calculation method example (see Appendix C);
- Added new calculation example (see Appendix E).

This section uses the translation method identical with IEC 60534-2-1:2011 "Industrial Process Control Valve Part 2-1. Flow capacity to install Fluid flow under the formula".

This part of IEC 60534-2-1:2011 made the following editorial changes.

- Correct the original 8.4 note the error, the table D.1 to Table D.2;
- Correct the original C.3 formula number error, equation (17), equation (6), equation (7), equation (8) were replaced by equation (16), equation (5), equation , Equation (7);
- Correct the original table D.1 argon symbols wrong;
- Correct the original Appendix E Example 5 data error.

This part is proposed by China Machinery Industry Federation.

This part of the National Industrial Process Measurement Control and Automation Standardization Technical Committee (SAC/TC124) centralized.

This section is drafted unit. Shanghai Industrial Automation Instrumentation Research Institute, Zhejiang Insein Technology Co., Ltd., Hangzhou Liang Valve Co., Ltd.

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Limited company.

1 Scope

GB/T 17213 This section gives the prediction of flow through the control valve compressible fluid and incompressible fluid flow formula.

The formula for incompressible fluids is derived from the standard fluid dynamics equations for incompressible Newtonian fluids and can not be extended to non-cow A fluid, a mixed fluid, a suspension, or a two-phase fluid. Special attention should be paid to the use of this formula for liquids that are not vaporizable and have multiple ingredients.

See Chapter 6 for more information.

When the ratio of pressure differential to inlet absolute pressure ($\Delta p/p_1$) is low, the properties of compressible fluids are similar to those of incompressible fluids. In this situation in this case, the formulas given in this section can be derived from Newton's incompressible fluid equations. However, when the value of $\Delta p/p_1$ increases, it may be caused Compression effect, which requires the use of appropriate correction factor to correct the basic equations. The formulas proposed in this section apply to ideal gas or steam Steam does not apply to multiphase flow of gas-liquid, vapor-liquid or gas-solid mixtures. Only when the specific heat ratio γ satisfies $1.08 < \gamma < 1.65$ in order to maintain reasonable accuracy. See 7.2 for more information.

For compressible fluid applications, this section applies to $x_T \leq 0.84$ (see Table D.2) control valve. Control valve for $x_T > 0.84$ (some Multi-stage valve), the flow of prediction may be a greater deviation.

Only if C

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< 0.047 , the control valve to maintain reasonable accuracy.

Note that the formula structure given in this section may differ from the formula structure in previous versions of this section, but the basic principle is that Relatively unchanged. The revised formula structure is used to simplify the expression of many formulas and increase the readability of this