SLOVENSKI STANDARD

SIST EN 60534-2-5:2004

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Industrial-process control valves - Part 2-5: Flow capacity - Sizing equations for fluid flow through multistage control valves with interstage recovery

ICS 23.060.40; 25.040.40

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EUROPEAN STANDARD **EN 60534-2-5**

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English version

Industrial-process control valves Part 2-5: Flow capacity – Sizing equations for fluid flow through multistage control valves with interstage recovery (IEC 60534-2-5:2003)

Vannes de régulation des processus industriels
Partie 2-5: Capacité d'écoulement – Equations de dimensionnement pour l'écoulement des fluides dans les vannes de régulation multi-étagées avec récupération entre étages
(CEI 60534-2-5:2003)

Stellventile für die Prozessregelung
Teil 2-5: Durchflusskapazität – Bemessungsgleichungen für Fluide durch Mehrstufenregelventile mit Druckrückgewinn zwischen den Stufen
(IEC 60534-2-5:2003)

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CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 60534-2-5:2003 E

Foreword

The text of document 65B/488/FDIS, future edition 1 of IEC 60534-2-5, prepared by SC 65B, Devices, of IEC TC 65, Industrial-process measurement and control, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60534-2-5 on 2003-10-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2004-07-01

– latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2006-10-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annex ZA is normative and annexes A and B are informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60534-2-5:2003 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60534-1	1987	Industrial-process control valves Part 1: Control valve terminology and general considerations	EN 60534-1	1993
IEC 60534-2-1	1998	Part 2-1: Flow capacity - Sizing equations for fluid flow under installed conditions	EN 60534-2-1	1998
IEC 60534-2-3	1997	Part 2-3: Flow capacity - Test procedures	EN 60534-2-3	1998

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Industrial process control valves –

Part 2-5:
Flow capacity –
Sizing equations for fluid flow through multistage control valves with interstage recovery

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INDUSTRIAL-PROCESS CONTROL VALVES –

Part 2-5: Flow capacity – Sizing equations for fluid flow through multistage control valves with interstage recovery

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60534-2-5 has been prepared by subcommittee 65B: Devices, of IEC technical committee 65: Industrial-process measurement and control.

The text of this standard is based on the following documents:

FDIS	Report on voting
65B/488/FDIS	65B/502/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

INTRODUCTION

This part of IEC 60534 includes equations for predicting flow which are the same as IEC 60534-2-1. The differences in this multistage standard are:

a) the equation for the calculation of expansion factor Y (equation 18);

b) the non-inclusion of the section on sizing for laminar flow;

c) the inclusion of stage interaction factor k (8.8) and reheat factor r (8.9);

d) the addition of Tables for multistage valves for values of F_L and x_T.

The test data used to validate the method for numbers of stages from one to five was obtained from sizing tests carried out in accordance with IEC 60534-2-3 using air as the test medium at pressures varying from 5×10^5 Pa to $13{,}5 \times 10^5$ Pa and at temperatures of approximately 300 K. Some data was obtained under plant conditions using steam at pressures varying from 12×10^5 Pa to 110×10^5 Pa and temperatures from 460 K to 750 K.

The method is applicable to any number of stages but has only been validated up to five stages.

If valve specific coefficients (such as K_v or C_v, F_L, and x_T) cannot be determined by appropriate test procedures in IEC 60534-2-3, values supplied by the manufacturer should then be used.

INDUSTRIAL-PROCESS CONTROL VALVES –

Part 2-5: Flow capacity – Sizing equations for fluid flow through multistage control valves with interstage recovery

1 Scope

This part of IEC 60534 includes equations for predicting the flow of compressible and incompressible fluids through multistage control valves.

The equations for incompressible flow are based on standard hydrodynamic equations for Newtonian incompressible fluids. They are not intended for use when non-Newtonian fluids, fluid mixtures, slurries, or liquid-solid conveyance systems are encountered.

At very low ratios of pressure differential to absolute inlet pressure ($\Delta p/p_1$), compressible fluids behave similarly to incompressible fluids. Under such conditions, the sizing equations for compressible flow can be traced to the standard hydrodynamic equations for Newtonian incompressible fluids. However, increasing values of $\Delta p/p_1$ result in compressibility effects which require that the basic equations be modified by appropriate correction factors. The equations for compressible fluids are for use with gas or vapour and are not intended for use with multiphase streams such as gas-liquid, vapour-liquid or gas-solid mixtures.

This standard is applicable only to those designs of multistage multipath control valves and multistage single path control valves.

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.

IEC 60534-1:1987, *Industrial-process control valves – Part 1: Control valve terminology and general considerations*

IEC 60534-2-1:1998, *Industrial-process control valves – Part 2-1: Flow capacity – Sizing equations for fluid flow under installed conditions*

IEC 60534-2-3:1997, *Industrial-process control valves – Part 2-3: Flow capacity – Test procedures*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60534-1 and the following apply.