EESTI STANDARD EVS-EN 60534-2-1:2002

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

EESTI STANDARDIKESKUS

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 60534-2-1:2002 sisaldab Euroopa standardi EN 60534-2-1:1998 ingliskeelset teksti.	This Estonian standard EVS-EN 60534-2-1:2002 consists of the English text of the European standard EN 60534-2-1:1998.
Standard on kinnitatud Eesti Standardikeskuse 18.12.2002 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.	This standard is ratified with the order of Estonian Centre for Standardisation dated 18.12.2002 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.
Standard on kättesaadav Eesti standardiorganisatsioonist.	The standard is available from Estonian standardisation organisation.

ICS 23.060.40, 25.040.40

65B

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 60534-2-1

October 1998

ICS 23.060.40; 25.040.40

Supersedes EN 60534-2-1:1993 & EN 60534-2-2:1993

Descriptors: Industrial-process, control valves, installed conditions, flow capacity, sizing equations

English version

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

Vannes de régulation des processus industriels
Partie 2-1: Capacité d'écoulement
Equations de dimensionnement des vannes de régulation pour l'écoulement des fluides dans les conditions d'installation
(CEI 60534-2-1:1998)

Stellventile für die Prozeßregelung
Teil 2-1: Durchflußleistung
Bemessungsgleichungen für Fluide unter Einbaubedingungen
(IEC 60534-2-1:1998)

This European Standard was approved by CENELEC on 1998-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Foreword

The text of document 65B/347/FDIS, future edition 1 of IEC 60534-2-1, 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 60534-2-1 on 1998-10-01.

This European Standard supersedes EN 60534-2-1:1993 and EN 60534-2-2:1993.

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) 1999-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2001-07-01

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, B, C, D and E are informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60534-2-1:1998 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 60534-2-3	1997	Part 2-3: Flow capacity - Test procedures	EN 60534-2-3	1998

INTERNATIONAL STANDARD

IEC 60534-2-1

First edition
1998-09

Industrial-process control valves –

Part 2-1: Flow capacity – Sizing equations for fluid flow under installed conditions

Vannes de régulation des processus industriels –

Partie 2-1:
Capacité d'écoulement –
Equations de dimensionnement des vannes de régulation pour l'écoulement des fluides dans les conditions d'installation

Reference number
IEC 60534-2-1:1998(E)

Numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series.

Consolidated publications

Consolidated versions of some IEC publications including amendments are available. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Validity of this publication

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology.

Information relating to the date of the reconfirmation of the publication is available in the IEC catalogue.

Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is to be found at the following IEC sources:

- **IEC web site***
- **Catalogue of IEC publications**
  Published yearly with regular updates
  (On-line catalogue)*
- **IEC Bulletin**
  Available both at the IEC web site and as a printed periodical

Terminology, graphical and letter symbols

For general terminology, readers are referred to IEC 60050: *International Electrotechnical Vocabulary* (IEV).

For graphical symbols, and letter symbols and signs approved by the IEC for general use, readers are referred to publications IEC 60027: *Letter symbols to be used in electrical technology*, IEC 60417: *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets* and IEC 60617: *Graphical symbols for diagrams.*

* See web site address on title page.

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE X

For price, see current catalogue

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INDUSTRIAL-PROCESS CONTROL VALVES –

Part 2-1: Flow capacity – Sizing equations for fluid flow under installed conditions

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60534-2-1 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/347/FDIS	65B/357/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.

The edition of IEC 60534-2-1 cancels and replaces the first edition of both IEC 60534-2 published in 1978, and IEC 60534-2-2 published in 1980, which cover incompressible and compressible fluid flow, respectively.

IEC 60534-2-1 covers sizing equations for both incompressible and compressible fluid flow.

Annexes A, B, C, D and E are for information only.

A bilingual version of this standard may be issued at a later date.

INDUSTRIAL-PROCESS CONTROL VALVES –

Part 2-1: Flow capacity – Sizing equations for fluid flow under installed conditions

1 Scope

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

For compressible fluid applications, this part of IEC 60534 is valid for valves with $x_T \leq 0{,}84$ (see table 2). For valves with $x_T > 0{,}84$ (e.g. some multistage valves), greater inaccuracy of flow prediction can be expected.

Reasonable accuracy can only be maintained for control valves if $K_v/d^2 < 0{,}04$ ($C_v/d^2 < 0{,}047$).

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60534. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 60534 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

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