IEC 60534-1

Edition 4.0 2023-05
REDLINE VERSION

# INTERNATIONAL STANDARD





## Industrial-process control valves –
## Part 1: Control valve terminology and general considerations

IEC 60534-1:2023-05 RLV(en)

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## Part 1: Control valve terminology and general considerations

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 23.060.40; 25.040.40

ISBN 978-2-8322-7065-3

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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# INDUSTRIAL-PROCESS CONTROL VALVES –

## Part 1: Control valve terminology and general considerations

## FOREWORD

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**This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60534-1:2005. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.**

IEC 60534-1 has been prepared by subcommittee 65B: Measurement and control devices, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2005. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) update of the definitions given in IEC 60534-1 in order to harmonize them with current terminology;
b) addition of terms common to individual standards in the 60534 series; and
c) further clarification in existing definitions.

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

| Draft | Report on voting |
|---|---|
| 65B/1228/FDIS | 65B/1235/RVD |

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

IEC 60534 consists of the following parts, under the general title *Industrial-process control valves*:

Part 1: *Control valve terminology and general considerations*
Part 2-1: *Flow capacity – Sizing equations for fluid flow under installed conditions*
Part 2-3: *Flow capacity – Test procedures*
Part 2-4: *Flow capacity – Section Four: Inherent flow characteristics and rangeability*
Part 3-1: *Dimensions – Face-to-face dimensions for flanged, two-way, globe-type, straight pattern and centre-to-face dimensions for flanged, two-way, globe-type, angle pattern control valves*
Part 3-2: *Dimensions – Face-to-face dimensions for rotary control valves except butterfly valves*
Part 3-3: *Dimensions – End-to-end dimensions for buttweld, two-way, globe-type, straight pattern control valves*
Part 4: *Inspection and routine testing*
Part 5: *Marking*
Part 6-1: *Mounting details for attachment of positioners to control valves – Section 1: Positioner mounting on linear actuators*
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Part 7: *Control valve data sheet*
Part 8-1: *Noise considerations – Section One: Laboratory measurement of noise generated by aerodynamic flow through control valves*

Part 8-2: *Noise considerations – Section 2: Laboratory measurement of noise generated by hydrodynamic flow through control valves*

Part 8-3: *Noise considerations – Control valve aerodynamic noise prediction method*

Part 8-4: *Noise considerations – Section 4: Prediction of noise generated by hydrodynamic flow*

Part 9: *Test procedure for response measurements from step inputs*

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

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**INDUSTRIAL-PROCESS CONTROL VALVES –**

**Part 1: Control valve terminology and general considerations**

# 1 Scope

This part of IEC 60534 applies to all types of industrial-process control valves (hereinafter referred to as control valves). This document establishes a partial basic terminology list and provides guidance on the use of all other parts of IEC 60534.

# 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 (all parts), *Industrial-process control valves*

# 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

## 3.1 Component terminology

**3.1.1**
**control valve**
power-operated device that changes the fluid flow rate in a process control system

Note 1 to entry: ~~It~~ The device assembly consists of a valve connected to an actuator that is capable of changing the position of a closure member in the valve in response to a signal from the controlling system.

**3.1.1.1**
**control valve with a linear motion closure member**
valve that contains a closure member that moves in a line perpendicular to the seating plane

**3.1.1.1.1**
**diaphragm valve**
valve in which a flexible closure member isolates the line fluid from the actuating mechanism and provides a seal to the atmosphere

**3.1.1.1.2**
**gate valve**
valve whose closure member is a flat gate that moves in a direction parallel to the plane of the seat

**3.1.1.1.3**
**globe ~~(angle)~~ valve**
valve in which the closure member moves in a direction perpendicular to the plane of the seat(s)

Note 1 to entry: This definition is applicable to both straight and angle pattern control valves.

**3.1.1.2**
**control valve with a rotary motion closure member**
valve that contains a closure member that is rotated into or away from a seat to modulate flow

**3.1.1.2.1**
**ball valve**
valve with a closure member that is a sphere with an internal passage wherein the centre of the spherical surface is coincident with the axis of the shaft

**3.1.1.2.2**
**segmented ball valve**
valve with a closure member that is a segment of a sphere wherein the centre of the spherical surface is coincident with the axis of the shaft

**3.1.1.2.3**
**butterfly valve**
valve with a circular body and a rotary motion disk closure member, pivotally supported by its shaft

Note 1 to entry: The shaft and/or closure member may be centred or offset.

**3.1.1.2.3.1**
**fluted vane butterfly valve**
butterfly valve which has flutes (grooves) on the face(s) of the disk

Note 1 to entry: These flutes are intended to shape the flow stream without altering the seating line or seating surface.

**3.1.1.2.4**
**plug valve**
valve with a closure member that is cylindrical or conical, with an internal passage

**3.1.1.2.5**
**eccentric plug valve**
valve with an eccentric closure member that may be in the shape of a spherical or conical segment

Note 1 to entry: Not every control valve can be exclusively categorized as linear or rotary as defined above.

**3.2**
**valve**
assembly forming a pressure retaining envelope containing a closure member for changing the flow rate of the process fluid

**3.2.1.1**
**valve body**
part of the valve which is the main pressure retaining boundary and provides the fluid-flow passageways and the pipe-connecting ends

**3.2.1.2**
**bonnet**
portion of the valve which closes an opening in the body and through which passes the stem connecting the closure member to the actuator

**3.2.1.3**
**end connection**
valve body configuration provided to make a pressure tight joint to the pipe carrying the fluid to be controlled

**3.2.1.3.1**
**flanged ends**
end connections incorporating flanges which allow pressure seals by mating with corresponding flanges on the piping

**3.2.1.3.2**
**flangeless ends**
end connections where no flanges are incorporated on the valve body and installation is accomplished by clamping the valve between the pipe flanges

Note 1 to entry: Valve body ends incorporate facings which mate with corresponding facings on flanges attached to the connecting piping. ~~Installation is accomplished by clamping the valve between the pipe flanges~~

**3.2.1.3.3**
**threaded ends**
end connections incorporating threads, either male or female

**3.2.1.3.4**
**welded ends**
end connections where valve body ends have been prepared for welding to the line pipe or other fittings

Note 1 to entry: Such connections may be of the butt-weld or socket-weld types

**3.2.1.4**
**valve trim**
functional components of the valve, excluding the body, bonnet and blind head (if present), which are in contact with the fluid

**3.2.1.4.1**
**independent flow passage**
flow passage where the exiting flow is not affected by the exiting flow from adjacent flow passages

**3.2.1.4.2**
**valve seats**
corresponding sealing surfaces within a control valve which make full contact when the control valve is in the closed position

**3.2.1.4.3**
**seat ring**
part assembled in the valve body to provide a removable valve seat

**3.2.1.4.4**
**closure member**
movable part of the valve which is positioned in the flow path to restrict the flow through the valve

Note 1 to entry: A closure member may be a plug, ball, disk, vane, gate, diaphragm, etc.

**3.2.1.4.5**
**valve stem (or shaft)**
component extending through the bonnet which connects the actuator to, and positions, the closure member

Note 1 to entry: For rotary valves, the word shaft should be used in place of stem.

**3.2.2**
**actuator**
device or mechanism which transforms a signal into a corresponding movement controlling the position of the internal regulating mechanism (closure member) of the control valve

Note 1 to entry: The signal or energizing force may be pneumatic, electric, hydraulic, or any combination thereof.

**3.2.2.1**
**actuator power unit**
that part of the actuator which coverts fluid, electrical, thermal or mechanical energy into actuator stem motion to develop thrust or torque

**3.2.2.2**
**yoke**
structure which rigidly connects the actuator power unit to the valve. It can be an integral part of the bonnet or actuator

**3.2.2.3**
**actuator stem**
component which transmits motion from the actuator power unit to the valve stem (or shaft)

**3.2.3**
**fitting**
any device such as a reducer, expander, elbow, T-piece, or bend which is either close-coupled or attached direct to an end connection of a control valve

## 3.3 Functional terminology

**3.3.1**
**nominal size**
**DN**
alphanumeric designation of size for components of a pipework system, which is used for reference purposes~~. It comprises~~, comprised of the letters DN followed by a dimensionless whole number which is related direct to physical size, in millimetres, of the bore or outside diameter of the end connections

Note 1 to entry: It is designated by the letters DN followed by a number from the following series: 10; 15; 20; 25; 32; 40; 50; 65; 80; 100; 125; 150; 200; 250; 300; 350; 400; etc.

Note 2 to entry: The number following the letters DN does not represent a measurable value and should not be used for calculation purposes except where specified in the relevant standard.

Note 3 to entry: The definition of nominal size is in accordance with ISO 6708.

**3.3.2**
**nominal pressure**
**PN**
alphanumerical designation of pressure which is a convenient rounded number for reference purposes

Note 1 to entry: All equipment of the same nominal size (DN) designated by the same PN number shall have compatible mating dimensions

Note 2 to entry: The maximum allowable pressure depends upon materials, design and working temperatures and should be selected from the pressure/temperature rating tables in the appropriate standards.

Note 3 to entry: It is designated by the letters PN followed by the appropriate reference number from the following series: 2,5; 6; 10; 16; 20; 25; 40; 50; etc. (see ISO 7268 and EN ~~61333~~ 1333).

Note 4 to entry: The definition of nominal pressure is in accordance with ISO 7268.

**3.3.3**
**NPS**
numeric designation of size for components of a pipework system, which is used for reference purposes. It comprises, comprised of the letters NPS followed by a dimensionless number and related to nominal size DN as follows:

| DN | 10 | 15 | 20 | 25 | 32 | 40 | 50 | 65 | 80 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|
| NPS | 3/8 | ½ | ¾ | 1 | 1 ¼ | 1 ½ | 2 | 2 ½ | 3 | 4 |

Note 1 to entry: For NPS greater than 4, the equivalence is DN = 25 times NPS.

**3.3.4**
**class**
convenient round number used to designate pressure-temperature ratings according to appropriate standards

Note 1 to entry: It is designated by the word Class followed by the appropriate reference number from the following series: 125; 150; 250; 300; 600; 900; 1500; 2500.

**3.3.5**
**closure member position**

**3.3.5.1**
**closed position**
position of the closure member when a continuous surface or line of contact is established with the valve seat

Note 1 to entry: For non-seating valves, the closed position is obtained when the flow passageway is minimum.

**3.3.5.2**
**travel**
displacement of the closure member from the closed position

**3.3.5.3**
**rated travel**
displacement of the closure member from the closed position to the designated full open position

**3.3.5.4**
**relative travel, *h***
ratio of the travel at a given opening to the rated travel

**3.3.5.5**
**over-travel**
displacement of the actuator stem, or shaft, beyond the closed position

Note 1 to entry: For some valve designs, over-travel may occur as the closure member moves to a mechanical stop position after full exposure of the flow restricting orifice(s).

**3.3.6**
**flow coefficient**
basic coefficient used to state the flow capacity of a control valve under specified conditions

Note 1 to entry: Flow coefficients in current use are $K_v$ and $C_v$ depending upon the system of units

Note 2 to entry: It will be noted that the dimensions and units on each of the following defined flow coefficients are different. However, it is possible to relate these flow coefficients numerically. This relationship is as follows:

$$\frac{K_v}{C_v} = 0{,}865 \quad (1)$$

Note 3 to entry: The flow coefficient definitions for $K_v$ and $C_v$ include some units, nomenclature, and temperature values which are not consistent with other parts of IEC 60534. These inconsistencies are limited to this subclause and are only used to show the unique relationships traditionally used in the control valve industry. These inconsistencies do not affect the other parts of IEC 60534.

**3.3.6.1**
**flow coefficient, $K_v$**
flow coefficient $K_v$ in cubic metres per hour is a special volumetric flow rate in cubic metres per hour (capacity) through a valve at a specified travel and in the following conditions:

– the static pressure loss ( $\Delta p_{K_v}$ ) across the valve is $10^5$ Pa (1 bar),

– the fluid is water within a temperature range of 278 K to 313 K (5 °C to 40 °C),

– the unit of the volumetric flow rate is the cubic metre per hour

Note 1 to entry: More information can be found in IEC 60534-2-1.

The value of $K_v$ can be obtained from test results with the help of the following equation:

$$K_v = Q\sqrt{\left(\frac{\Delta p_{K_v}}{\Delta p}\right)\left(\frac{\rho}{\rho_w}\right)} \quad (2)$$

where

$Q$ is the measured volumetric flow rate in $m^3/h$;

$\Delta p_{K_v}$ is the static pressure loss of $10^5$ Pa (see above);

$\Delta p$ is the measured static pressure loss across the valve in Pa;

$\rho$ is the density of the fluid in $kg/m^3$;

$\rho_w$ is the density of water (see above) in $kg/m^3$ (1 000 $kg/m^3$).

Equation (2) is valid when the flow is turbulent, no cavitation or flashing occurs, and the DN (NPS) of the valve is equal to the DN (NPS) of the pipe

**3.3.6.2**
**flow coefficient, $C_v$**
the flow coefficient $C_v$ is a non-SI control valve coefficient which is in widespread use worldwide. Numerically, $C_v$ is represented as the number of US gallons of water, within a temperature range of 40 °F to 100 °F, that will flow through a valve in 1 min when a pressure drop of 1 psi exists. For conditions other than these, $C_v$ can be obtained using the following equation:

$$C_v = Q\sqrt{\left(\frac{\Delta p_{C_v}}{\Delta p}\right)\left(\frac{\rho}{\rho_w}\right)} \quad (3)$$

where

$Q$ is the measured volumetric flow rate in US gallons per minute (1 US gallon per minute = $6,309 \times 10^{-5}$ $m^3/s$);

$\rho$ is the density of the flowing fluid in pounds per cubic foot (1 $lb/ft^3$ = 16,018 $kg/m^3$);

$\rho_w$ is the density of water within a temperature range of 40 °F to 100 °F (4 °C to 38 °C) in pounds per cubic foot;

$\Delta p$ is the measured static pressure loss across the valve in psi (1 psi = 6894,8 Pa);

$\Delta p_{Cv}$ = 1 psi.

~~Equation (3) is valid when the flow is turbulent and no cavitation or flashing occurs~~

non-SI control valve coefficient which is in widespread use worldwide, represented numerically as the number of US gallons of water, that will flow through a valve in 1 min under the following conditions:

– The static pressure loss ( $\Delta p_{C_v}$ ) across the valve is 1 psi (0,0689 bar),

– the fluid is water within a temperature range of 40 ºF to 100 ºF (4 °C to 38 °C),

– the unit of the volumetric flow rate is US gallons per minute

Note 1 to entry: More information can be found in IEC 60534-2-1.

**3.6.3**
**rated flow coefficient**
value of the flow coefficient at the rated travel

**3.3.6.4**
**relative flow coefficient, $\Phi$**
ratio of the flow coefficient at a relative travel to the rated flow coefficient

**3.3.7**
**rated valve capacity**
rate of flow of a fluid (compressible or incompressible) that will pass through a valve at the rated travel under stated conditions

**3.3.8**
**valve style modifier, $F_d$**
ratio of the hydraulic diameter of a single flow passage to the diameter of a circular orifice, the area of which is equivalent to the sum of areas of all identical flow passages at a given travel

**3.3.9**
**seat leakage**
rate of flow of a fluid (compressible or incompressible) passing through an assembled valve in the closed position under specified test conditions (specifications for seat leakage classifications are contained in IEC 60534-4)

**3.3.10**
**inherent flow characteristic**
relationship between the relative flow coefficient, $\Phi$, and the corresponding relative travel, $h$, independent of the means of actuation (see IEC 60534-2-4)

**3.3.10.1**
**ideal inherent linear flow characteristic**
characteristic in which equal increments of relative travel, $h$, yield equal increments of relative flow coefficient, $\Phi$

Mathematically

$$\Phi = \Phi_o + mh \quad (2)$$

where

$\Phi_o$ is the relative flow coefficient corresponding to $h$ = 0,

$m$ is the slope of the straight line.

**3.3.10.2**
**ideal inherent equal percentage flow characteristic**
characteristic by which equal increments of relative travel, $h$, yield equal percentage increments of the relative flow coefficient, $\Phi$

Mathematically

$$\Phi = \Phi_o \, e^{nh} \qquad (3)$$

where

$\Phi_o$ is the relative flow coefficient corresponding to $h = 0$;

$n$ is the slope of the inherent equal percentage flow characteristic when $\log_e \Phi$ is plotted against $h$. Thus when $\Phi = 1$, $h = 1$ and $n = \log_e (1/\Phi_0)$.

**3.3.11**
**installed flow characteristic**
relationship between the flow rate and the closure member travel as it is moved from the closed position to rated travel as the pressure drop across the valve is influenced by the varying process conditions

**3.3.12**
**inherent rangeability**
ratio of the largest flow coefficient to the smallest flow coefficient within specified deviations (see IEC 60534-2-4)

**3.3.13**
**installed rangeability**
ratio between maximum and minimum flow passing through a control valve under actual operating conditions and where the slope of the installed flow characteristic stays within limits specified by the user

**3.3.14**
**choked flow**
~~limiting, or maximum, flow condition which either incompressible or compressible fluids can reach in passing through control valves. With either type of fluid and with fixed inlet (upstream) conditions, choked flow is evidenced by the failure of increasing pressure differentials to produce further increases in the flow rate~~

limiting, or maximum, flow rate which either incompressible or compressible fluids can reach in passing through a control valve for a fixed set of upstream conditions, valve geometry and relative travel

Note 1 to entry: Under this condition further increase in pressure differential no longer produces a corresponding increase in mass flow rate through the control valve.

**3.3.15**
**critical differential pressure ratio**
~~maximum ratio of differential pressure to inlet absolute pressure that is effective in all valve sizing equations for compressible fluids. Choked flow as defined in 4.13 occurs when this maximum ratio has been reached~~

difference between upstream and downstream static pressure, divided by the upstream absolute pressure, at which choked flow (as defined in 3.2.13) occurs for compressible fluids. The value is dependent on the specific fluid and valve style (see IEC 60534-2-1)

**3.3.16**
**dead band**
finite range of values of the input variable within which a variation of the input variable does not produce any measurable change in the output variable

**3.3.17**
**acoustical efficiency,** $\eta$
ratio of the stream power converted into sound power propagating downstream to the stream power of the mass flow

**3.3.18**
**peak frequency,** $f_p$
frequency at which the internal sound pressure is maximum

# 4 Testing requirements

## 4.1 Production testing

Minimum requirements for production test routines are given in IEC 60534-4, which also delineates a basis for inspecting control valves at a manufacturer's premises. Additional requirements shall be subject to normal negotiation depending upon the severity of the hazards expected, the service duty involved, and the design of the control valve to be used.

## 4.2 Type testing

### 4.2.1 Flow-capacity testing

For the purpose of evaluating control valve capacity, testing shall follow the procedures given in IEC 60534-2-3. These tests provide the information necessary for the determination of flow coefficients and related factors for both compressible and incompressible fluids which, in turn, permit prediction of gas, vapour or liquid flow rates under installed conditions.

### 4.2.2 Laboratory noise testing

Laboratory testing for the purpose of determining sound pressure levels shall follow the procedures given in IEC 60534-8-1 for gases and IEC 60534-8-2 for liquids.

### 4.2.3 Test specimen

Any valve or combination of valve, reducer, expander, or other fittings for which test data are required. All parts/accessories necessary to operate the specimen properly shall be included.

# 5 Prediction methods

## 5.1 Valve sizing

The determination of a control valve size, required for a given flow rate under specified pressure and temperature conditions, shall be carried out in accordance with IEC 60534-2-1. The prediction of the flow rate achievable for a specific size and style of control valve under specified pressure and temperature conditions shall be carried out by the corresponding procedures in this standard.

## 5.2 Noise levels

The sound pressure level to be expected at a point adjacent to an individual control valve when operating under specified conditions of pressure and temperature shall be determined using the procedure given in IEC 60534-8-3 for compressible fluids and IEC 60534-8-4 for incompressible fluids.

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Amendment 1:1984

~~EN 61333:1998, *Marking on U and E ferrite cores*~~

EN 1333:2006, *Flanges and their joints – Pipework components – Definition and selection of PN*

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IEC 60534-1

Edition 4.0 2023-05

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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

**Vannes de régulation des processus industriels –**
**Partie 1: Terminologie des vannes de régulation et considérations générales**

IEC 60534-1:2023-05(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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IEC 60534-1 has been prepared by subcommittee 65B: Measurement and control devices, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2005. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) update of the definitions given in IEC 60534-1 in order to harmonize them with current terminology;
b) addition of terms common to individual standards in the 60534 series; and
c) further clarification in existing definitions.

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

| Draft | Report on voting |
|---|---|
| 65B/1228/FDIS | 65B/1235/RVD |

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

IEC 60534 consists of the following parts, under the general title *Industrial-process control valves*:

Part 1: *Control valve terminology and general considerations*

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

Part 2-3: *Flow capacity – Test procedures*

Part 2-4: *Flow capacity – Section Four: Inherent flow characteristics and rangeability*

Part 3-1: *Dimensions – Face-to-face dimensions for flanged, two-way, globe-type, straight pattern and centre-to-face dimensions for flanged, two-way, globe-type, angle pattern control valves*

Part 3-2: *Dimensions – Face-to-face dimensions for rotary control valves except butterfly valves*

Part 3-3: *Dimensions – End-to-end dimensions for buttweld, two-way, globe-type, straight pattern control valves*

Part 4: *Inspection and routine testing*

Part 5: *Marking*

Part 6-1: *Mounting details for attachment of positioners to control valves – Section 1: Positioner mounting on linear actuators*

Part 6-2: *Mounting details for attachment of positioners to control valves – Positioner mounting on rotary actuators*

Part 7: *Control valve data sheet*

Part 8-1: *Noise considerations – Section One: Laboratory measurement of noise generated by aerodynamic flow through control valves*

Part 8-2: *Noise considerations – Section 2: Laboratory measurement of noise generated by hydrodynamic flow through control valves*

Part 8-3: *Noise considerations – Control valve aerodynamic noise prediction method*

Part 8-4: *Noise considerations – Section 4: Prediction of noise generated by hydrodynamic flow*

Part 9: *Test procedure for response measurements from step inputs*

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

# INDUSTRIAL-PROCESS CONTROL VALVES –

# Part 1: Control valve terminology and general considerations

## 1 Scope

This part of IEC 60534 applies to all types of industrial-process control valves (hereinafter referred to as control valves). This document establishes a partial basic terminology list and provides guidance on the use of all other parts of IEC 60534.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 (all parts), *Industrial-process control valves*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

### 3.1 Component terminology

**3.1.1**
**control valve**
power-operated device that changes the fluid flow rate in a process control system

Note 1 to entry: The device assembly consists of a valve connected to an actuator that is capable of changing the position of a closure member in the valve in response to a signal from the controlling system.

**3.1.1.1**
**control valve with a linear motion closure member**
valve that contains a closure member that moves in a line perpendicular to the seating plane

**3.1.1.1.1**
**diaphragm valve**
valve in which a flexible closure member isolates the line fluid from the actuating mechanism and provides a seal to the atmosphere

**3.1.1.1.2**
**gate valve**
valve whose closure member is a flat gate that moves in a direction parallel to the plane of the seat

**3.1.1.1.3**
**globe valve**
valve in which the closure member moves in a direction perpendicular to the plane of the seat(s)

Note 1 to entry: This definition is applicable to both straight and angle pattern control valves.

**3.1.1.2**
**control valve with a rotary motion closure member**
valve that contains a closure member that is rotated into or away from a seat to modulate flow

**3.1.1.2.1**
**ball valve**
valve with a closure member that is a sphere with an internal passage wherein the centre of the spherical surface is coincident with the axis of the shaft

**3.1.1.2.2**
**segmented ball valve**
valve with a closure member that is a segment of a sphere wherein the centre of the spherical surface is coincident with the axis of the shaft

**3.1.1.2.3**
**butterfly valve**
valve with a circular body and a rotary motion disk closure member, pivotally supported by its shaft

Note 1 to entry: The shaft and/or closure member may be centred or offset.

**3.1.1.2.3.1**
**fluted vane butterfly valve**
butterfly valve which has flutes (grooves) on the face(s) of the disk

Note 1 to entry: These flutes are intended to shape the flow stream without altering the seating line or seating surface.

**3.1.1.2.4**
**plug valve**
valve with a closure member that is cylindrical or conical, with an internal passage

**3.1.1.2.5**
**eccentric plug valve**
valve with an eccentric closure member that may be in the shape of a spherical or conical segment

Note 1 to entry: Not every control valve can be exclusively categorized as linear or rotary as defined above.

**3.2**
**valve**
assembly forming a pressure retaining envelope containing a closure member for changing the flow rate of the process fluid

**3.2.1.1**
**valve body**
part of the valve which is the main pressure retaining boundary and provides the fluid-flow passageways and the pipe-connecting ends

**3.2.1.2**
**bonnet**
portion of the valve which closes an opening in the body and through which passes the stem connecting the closure member to the actuator

**3.2.1.3**
**end connection**
valve body configuration provided to make a pressure tight joint to the pipe carrying the fluid to be controlled

**3.2.1.3.1**
**flanged ends**
end connections incorporating flanges which allow pressure seals by mating with corresponding flanges on the piping

**3.2.1.3.2**
**flangeless ends**
end connections where no flanges are incorporated on the valve body and installation is accomplished by clamping the valve between the pipe flanges

Note 1 to entry: Valve body ends incorporate facings which mate with corresponding facings on flanges attached to the connecting piping.

**3.2.1.3.3**
**threaded ends**
end connections incorporating threads, either male or female

**3.2.1.3.4**
**welded ends**
end connections where valve body ends have been prepared for welding to the line pipe or other fittings

Note 1 to entry: Such connections may be of the butt-weld or socket-weld types

**3.2.1.4**
**valve trim**
functional components of the valve, excluding the body, bonnet and blind head (if present), which are in contact with the fluid

**3.2.1.4.1**
**independent flow passage**
flow passage where the exiting flow is not affected by the exiting flow from adjacent flow passages

**3.2.1.4.2**
**valve seats**
corresponding sealing surfaces within a control valve which make full contact when the control valve is in the closed position

**3.2.1.4.3**
**seat ring**
part assembled in the valve body to provide a removable valve seat

**3.2.1.4.4**
**closure member**
movable part of the valve which is positioned in the flow path to restrict the flow through the valve

Note 1 to entry: A closure member may be a plug, ball, disk, vane, gate, diaphragm, etc.

**3.2.1.4.5**
**valve stem (or shaft)**
component extending through the bonnet which connects the actuator to, and positions, the closure member

Note 1 to entry: For rotary valves, the word shaft should be used in place of stem.

**3.2.2**
**actuator**
device or mechanism which transforms a signal into a corresponding movement controlling the position of the internal regulating mechanism (closure member) of the control valve

Note 1 to entry: The signal or energizing force may be pneumatic, electric, hydraulic, or any combination thereof.

**3.2.2.1**
**actuator power unit**
that part of the actuator which coverts fluid, electrical, thermal or mechanical energy into actuator stem motion to develop thrust or torque

**3.2.2.2**
**yoke**
structure which rigidly connects the actuator power unit to the valve. It can be an integral part of the bonnet or actuator

**3.2.2.3**
**actuator stem**
component which transmits motion from the actuator power unit to the valve stem (or shaft)

**3.2.3**
**fitting**
any device such as a reducer, expander, elbow, T-piece, or bend which is either close-coupled or attached direct to an end connection of a control valve

## 3.3 Functional terminology

**3.3.1**
**nominal size**
**DN**
alphanumeric designation of size for components of a pipework system, which is used for reference purposes, comprised of the letters DN followed by a dimensionless whole number which is related direct to physical size, in millimetres, of the bore or outside diameter of the end connections

Note 1 to entry: It is designated by the letters DN followed by a number from the following series: 10; 15; 20; 25; 32; 40; 50; 65; 80; 100; 125; 150; 200; 250; 300; 350; 400; etc.

Note 2 to entry: The number following the letters DN does not represent a measurable value and should not be used for calculation purposes except where specified in the relevant standard.

Note 3 to entry: The definition of nominal size is in accordance with ISO 6708.

**3.3.2**
**nominal pressure**
**PN**
alphanumerical designation of pressure which is a convenient rounded number for reference purposes

Note 1 to entry: All equipment of the same nominal size (DN) designated by the same PN number shall have compatible mating dimensions

Note 2 to entry: The maximum allowable pressure depends upon materials, design and working temperatures and should be selected from the pressure/temperature rating tables in the appropriate standards.

Note 3 to entry: It is designated by the letters PN followed by the appropriate reference number from the following series: 2,5; 6; 10; 16; 20; 25; 40; 50; etc. (see ISO 7268 and EN 1333).

Note 4 to entry: The definition of nominal pressure is in accordance with ISO 7268.

**3.3.3**
**NPS**
numeric designation of size for components of a pipework system, which is used for reference purposes, comprised of the letters NPS followed by a dimensionless number and related to nominal size DN as follows:

| DN | 10 | 15 | 20 | 25 | 32 | 40 | 50 | 65 | 80 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|
| NPS | 3/8 | ½ | ¾ | 1 | 1 ¼ | 1 ½ | 2 | 2 ½ | 3 | 4 |

Note 1 to entry: For NPS greater than 4, the equivalence is DN = 25 times NPS.

**3.3.4**
**class**
convenient round number used to designate pressure-temperature ratings according to appropriate standards

Note 1 to entry: It is designated by the word Class followed by the appropriate reference number from the following series: 125; 150; 250; 300; 600; 900; 1500; 2500.

**3.3.5**
**closure member position**

**3.3.5.1**
**closed position**
position of the closure member when a continuous surface or line of contact is established with the valve seat

Note 1 to entry: For non-seating valves, the closed position is obtained when the flow passageway is minimum.

**3.3.5.2**
**travel**
displacement of the closure member from the closed position

**3.3.5.3**
**rated travel**
displacement of the closure member from the closed position to the designated full open position

**3.3.5.4**
**relative travel, *h***
ratio of the travel at a given opening to the rated travel

**3.3.5.5**
**over-travel**
displacement of the actuator stem, or shaft, beyond the closed position

Note 1 to entry: For some valve designs, over-travel may occur as the closure member moves to a mechanical stop position after full exposure of the flow restricting orifice(s).

**3.3.6**
**flow coefficient**
basic coefficient used to state the flow capacity of a control valve under specified conditions

Note 1 to entry: Flow coefficients in current use are $K_v$ and $C_v$ depending upon the system of units

Note 2 to entry: It will be noted that the dimensions and units on each of the following defined flow coefficients are different. However, it is possible to relate these flow coefficients numerically. This relationship is as follows:

$$\frac{K_v}{C_v} = 0{,}865 \quad (1)$$

Note 3 to entry: The flow coefficient definitions for $K_v$ and $C_v$ include some units, nomenclature, and temperature values which are not consistent with other parts of IEC 60534. These inconsistencies are limited to this subclause and are only used to show the unique relationships traditionally used in the control valve industry. These inconsistencies do not affect the other parts of IEC 60534.

**3.3.6.1**
**flow coefficient, $K_v$**
special volumetric flow rate in cubic metres per hour (capacity) through a valve at a specified travel and in the following conditions:

– the static pressure loss ($\Delta p_{K_v}$) across the valve is $10^5$ Pa (1 bar),
– the fluid is water within a temperature range of 278 K to 313 K (5 °C to 40 °C),
– the unit of the volumetric flow rate is the cubic metre per hour

Note 1 to entry: More information can be found in IEC 60534-2-1.

**3.3.6.2**
**flow coefficient, $C_v$**
non-SI control valve coefficient which is in widespread use worldwide, represented numerically as the number of US gallons of water, that will flow through a valve in 1 min under the following conditions:

– The static pressure loss ($\Delta p_{C_v}$) across the valve is 1 psi (0,0689 bar),
– the fluid is water within a temperature range of 40 °F to 100 °F (4 °C to 38 °C),
– the unit of the volumetric flow rate is US gallons per minute

Note 1 to entry: More information can be found in IEC 60534-2-1.

**3.3.6.3**
**rated flow coefficient**
value of the flow coefficient at the rated travel

**3.3.6.4**
**relative flow coefficient, $\Phi$**
ratio of the flow coefficient at a relative travel to the rated flow coefficient

**3.3.7**
**rated valve capacity**
rate of flow of a fluid (compressible or incompressible) that will pass through a valve at the rated travel under stated conditions

**3.3.8**
**valve style modifier, $F_d$**
ratio of the hydraulic diameter of a single flow passage to the diameter of a circular orifice, the area of which is equivalent to the sum of areas of all identical flow passages at a given travel

**3.3.9**
**seat leakage**
rate of flow of a fluid (compressible or incompressible) passing through an assembled valve in the closed position under specified test conditions (specifications for seat leakage classifications are contained in IEC 60534-4)

**3.3.10**
**inherent flow characteristic**
relationship between the relative flow coefficient, $\Phi$, and the corresponding relative travel, $h$, independent of the means of actuation (see IEC 60534-2-4)

**3.3.10.1**
**ideal inherent linear flow characteristic**
characteristic in which equal increments of relative travel, $h$, yield equal increments of relative flow coefficient, $\Phi$

Mathematically

$$\Phi = \Phi_o + mh \qquad (2)$$

where

$\Phi_o$ is the relative flow coefficient corresponding to $h = 0$,

$m$ is the slope of the straight line.

**3.3.10.2**
**ideal inherent equal percentage flow characteristic**
characteristic by which equal increments of relative travel, $h$, yield equal percentage increments of the relative flow coefficient, $\Phi$

Mathematically

$$\Phi = \Phi_o \, e^{nh} \qquad (3)$$

where

$\Phi_o$ is the relative flow coefficient corresponding to $h = 0$;

$n$ is the slope of the inherent equal percentage flow characteristic when $\log_e \Phi$ is plotted against $h$. Thus when $\Phi = 1$, $h = 1$ and $n = \log_e (1/\Phi_0)$.

**3.3.11**
**installed flow characteristic**
relationship between the flow rate and the closure member travel as it is moved from the closed position to rated travel as the pressure drop across the valve is influenced by the varying process conditions

**3.3.12**
**inherent rangeability**
ratio of the largest flow coefficient to the smallest flow coefficient within specified deviations (see IEC 60534-2-4)

**3.3.13**
**installed rangeability**
ratio between maximum and minimum flow passing through a control valve under actual operating conditions and where the slope of the installed flow characteristic stays within limits specified by the user

**3.3.14**
**choked flow**
limiting, or maximum, flow rate which either incompressible or compressible fluids can reach in passing through a control valve for a fixed set of upstream conditions, valve geometry and relative travel

Note 1 to entry: Under this condition further increase in pressure differential no longer produces a corresponding increase in mass flow rate through the control valve.

**3.3.15**
**critical differential pressure ratio**
difference between upstream and downstream static pressure, divided by the upstream absolute pressure, at which choked flow (as defined in 3.2.13) occurs for compressible fluids. The value is dependent on the specific fluid and valve style (see IEC 60534-2-1)

**3.3.16**
**dead band**
finite range of values of the input variable within which a variation of the input variable does not produce any measurable change in the output variable

**3.3.17**
**acoustical efficiency, $\eta$**
ratio of the stream power converted into sound power propagating downstream to the stream power of the mass flow

**3.3.18**
**peak frequency, $f_p$**
frequency at which the internal sound pressure is maximum

# 4 Testing requirements

## 4.1 Production testing

Minimum requirements for production test routines are given in IEC 60534-4, which also delineates a basis for inspecting control valves at a manufacturer's premises. Additional requirements shall be subject to normal negotiation depending upon the severity of the hazards expected, the service duty involved, and the design of the control valve to be used.

## 4.2 Type testing

### 4.2.1 Flow-capacity testing

For the purpose of evaluating control valve capacity, testing shall follow the procedures given in IEC 60534-2-3. These tests provide the information necessary for the determination of flow coefficients and related factors for both compressible and incompressible fluids which, in turn, permit prediction of gas, vapour or liquid flow rates under installed conditions.

### 4.2.2 Laboratory noise testing

Laboratory testing for the purpose of determining sound pressure levels shall follow the procedures given in IEC 60534-8-1 for gases and IEC 60534-8-2 for liquids.

### 4.2.3 Test specimen

Any valve or combination of valve, reducer, expander, or other fittings for which test data are required. All parts/accessories necessary to operate the specimen properly shall be included.

# 5 Prediction methods

## 5.1 Valve sizing

The determination of a control valve size, required for a given flow rate under specified pressure and temperature conditions, shall be carried out in accordance with IEC 60534-2-1. The prediction of the flow rate achievable for a specific size and style of control valve under specified pressure and temperature conditions shall be carried out by the corresponding procedures in this standard.

### 5.2 Noise levels

The sound pressure level to be expected at a point adjacent to an individual control valve when operating under specified conditions of pressure and temperature shall be determined using the procedure given in IEC 60534-8-3 for compressible fluids and IEC 60534-8-4 for incompressible fluids.

# Bibliography

IEC 61987-21:2015, *Industrial-process measurement and control – Data structures and elements in process equipment catalogues – Part 21: List of Properties (LOP) of automated valves for electronic data exchange – Generic structures*

ISO 6708:1995, *Pipework components – Definition and selection of DN (nominal size)*

ISO 7268:1983, *Pipe components – Definition of nominal pressure*
Amendment 1:1984

EN 1333:2006, *Flanges and their joints – Pipework components – Definition and selection of PN*

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SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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# VANNES DE RÉGULATION DES PROCESSUS INDUSTRIELS –

## Partie 1: Terminologie des vannes de régulation et considérations générales

## AVANT-PROPOS



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L'IEC 60534-1 a été établie par le sous-comité 65B: Équipements de mesure et de contrôle-commande, du comité d'études 65 de l'IEC: Mesure, commande et automation dans les processus industriels. Il s'agit d'une Norme internationale.

Cette quatrième édition annule et remplace la troisième édition publiée en 2005. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) une mise à jour des définitions données dans l'IEC 60534-1 afin de les harmoniser avec la terminologie actuelle;

b) l'ajout de termes communs aux différentes normes de la série IEC 60534; et

c) des clarifications dans les définitions existantes.

Le texte de cette norme est issu des documents suivants:

| Projet | Rapport de vote |
|---|---|
| 65B/1228/FDIS | 65B/1235/RVD |

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Le présent document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/publications.

L'IEC 60534 comprend les parties suivantes, publiées sous le titre général *Vannes de régulation des processus industriels:*

Partie 1: *Terminologie des vannes de régulation et considérations générales*

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

Partie 2-3: *Capacité d'écoulement – Procédures d'essais*

Partie 2-4: *Capacité d'écoulement – Caractéristiques intrinsèques de débit et coefficient intrinsèque de réglage*

Partie 3-1: *Dimensions – Écartements hors-brides des vannes de régulation deux voies droites à soupapes et à brides et dimensions centre/bride des vannes de régulation deux voies coudées à brides*

Partie 3-2: *Dimensions – Dimensions face à face des vannes de régulation rotatives excepté les vannes papillon*

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Partie 4: *Inspection et essais individuels*

Partie 5: *Marquage*

Partie 6-1: *Détails d'assemblage pour le montage des positionneurs sur les actionneurs de vannes de régulation – Section 1: Montage des positionneurs sur les actionneurs linéaires*

Partie 6-2: *Détails d'assemblage pour le montage des positionneurs sur les actionneurs de vannes de régulation – Montage des positionneurs sur les actionneurs rotatifs*

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Partie 8-1: *Considérations sur le bruit – Mesure en laboratoire du bruit créé par un débit aérodynamique à travers une vanne de régulation*

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Partie 8-3: *Considérations sur le bruit – Méthode de prédiction du bruit aérodynamique des vannes de régulation*

Partie 8-4: *Considérations sur le bruit – Prévisions du bruit généré par un écoulement hydrodynamique*

Partie 9: *Procédures d'essai pour la mesure de la réponse des vannes de régulation à des signaux d'entrée échelonnés*

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# VANNES DE RÉGULATION DES PROCESSUS INDUSTRIELS –

## Partie 1: Terminologie des vannes de régulation et considérations générales

## 1 Domaine d'application

La présente partie de l'IEC 60534 s'applique à tous les types de vannes de régulation des processus industriels (désignés ci-après sous le terme vannes de régulation). Le présent document établit une liste terminologique de base partielle et fournit des recommandations d'utilisation de toutes les autres parties de l'IEC 60534.

## 2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60534 (toutes les parties), *Vannes de régulation des processus industriels*

## 3 Termes et définitions

Pour les besoins du présent document, les termes et définitions suivants s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse http://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse http://www.iso.org/obp

### 3.1 Terminologie des composants

**3.1.1**
**vanne de régulation**
dispositif actionné mécaniquement qui modifie la valeur du débit de fluide dans un système de commande de processus

Note 1 à l'article: Ce dispositif est constitué d'une vanne reliée à un actionneur capable de faire varier la position d'un organe de fermeture dans la vanne en réponse à un signal provenant du système de commande.

**3.1.1.1**
**vanne de régulation avec organe de fermeture à mouvement linéaire**
vanne contenant un organe de fermeture qui se déplace perpendiculairement au plan du siège

**3.1.1.1.1**
**vanne à diaphragme**
vanne dans laquelle un organe de fermeture souple isole le fluide du mécanisme de manœuvre et assure l'étanchéité vers l'atmosphère

**3.1.1.1.2**
**robinet-vanne**
vanne dont l'organe de fermeture est un tiroir plat qui se déplace parallèlement au plan du siège

**3.1.1.1.3**
**vanne à soupape**
vanne dont l'organe de fermeture se déplace perpendiculairement au plan du ou des sièges

Note 1 à l'article: Cette définition s'applique aussi bien aux vannes de régulation à tête droite qu'aux vannes de régulation à sortie d'équerre.

**3.1.1.2**
**vanne de régulation avec organe de fermeture à mouvement rotatif**
vanne dont l'organe de fermeture vient pivoter dans ou hors d'un siège pour moduler le débit

**3.1.1.2.1**
**vanne à tournant sphérique**
vanne dont l'organe de fermeture est une sphère à passage intérieur. Le centre de la surface sphérique coïncide avec l'axe de l'arbre

**3.1.1.2.2**
**vanne à secteur sphérique**
vanne dont l'organe de fermeture est un segment de sphère. Le centre de la surface sphérique coïncide avec l'axe de l'arbre

**3.1.1.2.3**
**vanne papillon**
vanne avec un corps circulaire et dont l'organe de fermeture est un disque pivotant supporté par son arbre

Note 1 à l'article: L'arbre et/ou l'organe de fermeture peuvent être centrés ou décalés.

**3.1.1.2.3.1**
**vanne papillon à disque rainuré**
vanne papillon dont la ou les faces du disque comprennent des rainures

Note 1 à l'article: Ces rainures ont pour but de profiler l'écoulement sans interrompre la ligne de siège ou la surface de siège.

**3.1.1.2.4**
**vanne à boisseau**
vanne dont l'organe de fermeture est cylindrique ou conique, avec un passage interne

**3.1.1.2.5**
**vanne à obturateur excentré**
vanne dont l'organe de fermeture excentré peut être en forme de segment sphérique ou conique

Note 1 à l'article: Toutes les vannes de régulation ne peuvent pas être exclusivement classées parmi les vannes linéaires ou rotatives telles que définies ci-dessus.

**3.2**
**vanne**
ensemble constitué d'une enveloppe contenant la pression et renfermant un organe de fermeture capable de faire varier le débit du fluide du processus

**3.2.1**

**corps de vanne**
partie de la vanne qui est la limite principale contenant la pression et comporte les passages du fluide et les extrémités de raccordement aux tuyauteries

**3.2.1.1**
**chapeau**
partie de la vanne qui ferme une ouverture du corps et à travers laquelle passe la tige reliant l'organe de fermeture à l'actionneur

**3.2.1.2**
**raccordement d'extrémité**
partie du corps de vanne qui permet de réaliser une liaison étanche à la pression avec la tuyauterie transportant le fluide à contrôler

**3.2.1.2.1**
**extrémités à bride**
raccordements d'extrémité équipés de brides permettant une liaison étanche par accouplement avec les brides correspondantes de la tuyauterie

**3.2.1.2.2**
**extrémités sans brides**
raccordements d'extrémité ne possédant pas de brides intégrées au corps de vanne et dont l'installation est réalisée par serrage de la vanne entre les brides des tuyauteries

Note 1 à l'article: Les extrémités du corps de vanne comportent des portées qui s'adaptent aux portées correspondantes des brides des tuyauteries de liaison.

**3.2.1.2.3**
**extrémités filetées**
raccordements d'extrémité comprenant un filetage mâle ou femelle

**3.2.1.2.4**
**extrémité à souder**
raccordements d'extrémité préparés pour soudure à la tuyauterie ou à d'autres raccords

Note 1 à l'article: De tels raccordements d'extrémité peuvent être du type "à souder en bout" ou "à emboîter et à souder".

**3.2.1.3**
**équipement interne**
composants fonctionnels d'une vanne à l'exception du corps, du chapeau et du couvercle (si présent) qui sont en contact avec le fluide

**3.2.1.3.1**
**chemin d'écoulement indépendant**
chemin d'écoulement à la sortie duquel la veine fluide n'est pas influencée par les veines fluides des chemins d'écoulement adjacents

**3.2.1.3.2**
**sièges de vanne**
surfaces d'étanchéité correspondantes à l'intérieur d'une vanne de régulation qui établissent un plein contact lorsque la vanne de régulation est en position fermée

**3.2.1.3.3**
**siège**
pièce assemblée dans le corps de vanne pour constituer un siège de vanne amovible

**3.2.1.3.4**
**organe de fermeture**
pièce mobile de la vanne qui est placée dans le passage du débit pour réduire celui-ci.

Note 1 à l'article: Un organe de fermeture peut être un boisseau, une sphère, un disque, un tiroir, un tiroir, un diaphragme, etc.