

BS EN 1267:2012



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Industrial valves — Test of flow resistance using water as test fluid

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee PSE/18/1, Industrial valves, steam traps, actuators and safety devices against excessive pressure - Valves - Basic standards.

A list of organizations represented on this committee can be obtained on request to its secretary.

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ISBN 978 0 580 67641 3

ICS 23.060.01

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2012.

Amendments issued since publication

Date	Text affected
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 1267

January 2012

ICS 23.060.01

Supersedes EN 1267:1999

English Version

Industrial valves - Test of flow resistance using water as test fluid

Robinetterie industrielle - Essai de résistance à l'écoulement utilisant l'eau comme fluide d'essai

Industriearmaturen - Messung des Strömungswiderstandes mit Wasser als Prüfmedium

This European Standard was approved by CEN on 26 November 2011.

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Foreword

This document (EN 1267:2012) has been prepared by Technical Committee CEN/TC 69 “Industrial valves”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2012, and conflicting national standards shall be withdrawn at the latest by July 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1267:1999.

The main changes compared to the previous edition are the following:

- a) the scope was specified and editorially revised;
- b) the normative references were updated;
- c) Clause 3 on terms and definitions was revised;
- d) Clause 4 on test facility was changed;
- e) Clause 5 on test procedure was changed;
- f) Annex A on lower ζ limit considerations was revised;
- g) Annex D on evaluation of uncertainty of flow rate coefficient (K_v) and pressure losses coefficient (ζ) was added;
- h) a bibliography was added.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies a method for determining valve pressure loss coefficient and fluid flow coefficient using water as test fluid. This method is suitable

- for valves with low zeta values but higher than 0,1 by determining pressure loss, with respect to fluid flow rate and specific gravity, and
- for valves with equal inlet and outlet nominal size.

Industrial process control valves are excluded from this European Standard.

NOTE 1 For zeta values above 6, the pressure loss coefficient inaccuracy is higher than the pressure loss caused by the test tubes. It becomes the same configuration of tests as in EN 60534-2-3.

NOTE 2 If using air as test fluid, other standards e.g. EN 60534-2-3 and ISO 6358 should be referred to.

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.

EN 736-1:1995, *Valves — Terminology — Part 1: Definition of types of valves*

EN 736-3:2008, *Valves — Terminology — Part 3: Definition of terms*

EN 1057, *Copper and copper alloys — Seamless, round copper tubes for water and gas in sanitary and heating applications*

EN 24006:1993, *Measurement of fluid flow in closed conduits — Vocabulary and symbols (ISO 4006:1991)*

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

ISO 7-1:1994, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 7194:2008, *Measurement of fluid flow in closed conduits — Velocity-area methods of flow measurement in swirling or asymmetric flow conditions in circular ducts by means of current-meters or Pitot static tubes*

3 Terms and definitions

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

3.1

flow coefficient

K_v or C_v

[EN 736-3:2008, 3.4.1]

3.2

flow resistance coefficient

ζ

[EN 736-3:2008, 3.4.5]

3.3

fluctuations

low period modifications of the measured value of a physical quantity around its mean value during the measurement reading time

3.4

nominal diameter

DN

[EN ISO 6708:1995, 2.1]

3.5

stability

stability, or the permanent rating conditions, which is reached, when the variations or value changes for these same physical quantities are low enough between a given reading and the next one

3.6

types of valves

[EN 736-1:1995]

3.7

uncertainty

[EN 24006:1993, 5.26]

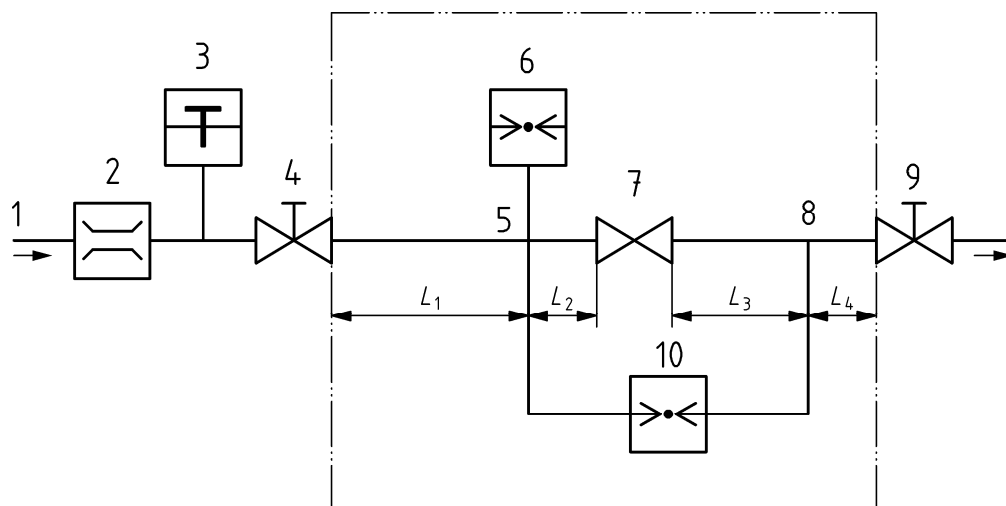
4 Test facility

4.1 General

A basic flow test facility is shown in Figure 1. The position of components outside the frame may be determined by the laboratory.

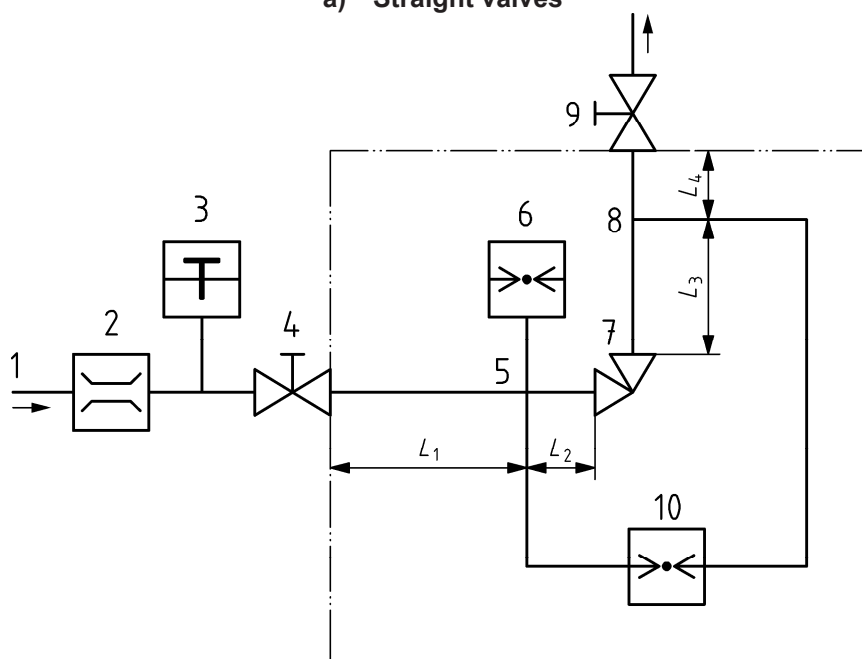
For angle valves (Figure 1 b)), the tested valve and the tube section (L_3 length) may be laid either vertically or horizontally.

For multi-way valves, additional test tubes of the same type shall be used, in the same conditions.



NOTE L_1 and $L_3 \geq 10 D$ and L_2 and $L_4 \geq 2 D$.

a) Straight valves



b) Angle or multiport valves

Key

- | | |
|-----------------------------------|---|
| 1 water supply | 6 upstream pressure measuring device |
| 2 flow meter | 7 valve under test |
| 3 temperature measurement | 8 downstream pressure tapping point |
| 4 regulating valve | 9 regulating valve |
| 5 upstream pressure tapping point | 10 differential pressure measuring device |

Figure 1 — Test installation

4.2 Test tube lengths

The test tube lengths and the pressure measurement point positions shall comply with Figure 1. Lengths are measured from test tube ends.

If the test facility includes two elbows in series in different planes upstream, a link L_1 greater than $10 D$, shall be adopted unless straightener is installed before the upstream test tube. If a flow straightener is used, length L_1 may be smaller than $10 D$, provided that the conditions in 5.1 are met.

For other details concerning flow straighteners, refer to ISO 7194:2008, Clause 6.

4.3 Test tube sizes

4.3.1 Steel test tubes

The test tubes (dimensions DN 8 to DN 150) can be threaded with an external taper thread as per ISO 7-1 (but with the pressure tap length indicated in Table 1) for use with threaded end valves, and also in order to adapt threaded flanges for flanged valves.

Table 1 — Tube sizes

Nominal size of valve DN	Nominal size of tube mm	Thread size	Gauge length mm
8	13,5 × 2,3	$\frac{1}{4}$	11,0
10	17,2 × 2,3	$\frac{3}{8}$	11,5
15	21,3 × 2,6	$\frac{1}{2}$	15,0
20	26,9 × 2,6	$\frac{3}{4}$	16,5
25	33,7 × 3,2	1	19,0
32	42,4 × 3,2	1 $\frac{1}{4}$	21,5
40	48,3 × 3,2	1 $\frac{1}{2}$	21,5
50	60,3 × 3,6	2	25,5
65	76,1 × 3,6	2 $\frac{1}{2}$	30,0
80	88,9 × 4,0	3	33,0
100	114,3 × 4,5	4	39,0
125	139,7 × 5,0	5	43,5
150	165,1 × 5,0	6	43,5
200	219,1 × 3,6		
250	273,0 × 4,0		
300	323,9 × 4,5		
350	355,6 × 5,0		
400	406,4 × 5,0		
450	457,0 × 5,0		
500	508,0 × 5,6		
600	610,0 × 6,3		

NOTE The nominal dimensions of DN 8 to DN 150 are in accordance with ISO 65, medium series and ISO 7598. The nominal dimensions of DN 200 to DN 600 are in accordance with ISO 4200, series C and EN ISO 1127.

4.3.2 Copper test tubes

Table 2 — Copper test tubes

Nominal size of valve DN	Nominal size of tube mm
8	10 × 0,8
10	12 × 1,0
15	15 × 1,0
15/20	18 × 1,0
20	22 × 1,0
25	28 × 1,5
32	35 × 1,5
40	42 × 1,5
50	54 × 1,5

Dimensions and tolerances shall be in accordance with EN 1057.

Test tubes shall be straight. Their ends shall be cut square and deburred. Their internal surfaces shall be cleaned and free from obstructions visible to the naked eye. Inner diameters are determined by the valve manufacturer unless otherwise specified in a valve, product or application standard. For valves with low ζ coefficient, the results obtained are affected by the test tube inner diameter. Therefore, the actual test tube inner diameter shall be mentioned (see Clause 7 b)).

NOTE When new test tubes are made, it is recommended to make them in accordance with Table 1 and Table 2.

4.4 Pressure tappings

The number of pressure taps is determined by the laboratory. At each pressure measurement section, there can be one, two or four tabs or a slot, provided that eccentricity is controlled. There should be four measurement taps for sizes greater than DN 300.

Pressure tap diameters shall comply with Table 3 and length shall be at least twice the diameter. The measurement tap hole on test tube internal surface is sharp-edged and free from burrs. The measurement tap hole centreline cuts the axis of the test tube. The pressure tap hole centreline is square to axis with a maximum tolerance of 5°. The inner diameter of connection tubes between taps and pressure measurement devices shall be at least twice the pressure tap hole diameter. To avoid dirt accumulation, no tap shall be located at measurement section bottom.

Table 3 — Pressure tap hole diameter

DN	Minimum mm	Maximum mm
< 20	1,5	2
20 to 50	2	3
> 50	3	5

4.5 Measurement devices

The pressure loss shall be measured with a differential pressure sensor.

The sensors or methods known further to calibration or by reference to other standards, providing measurements whose systematic uncertainty does not exceed the maximum permissible values, shall be used.

The accuracy of measurement shall be

- a) upstream pressure, differential pressure and flow rate: $\pm 2\%$ of the read value,
- b) temperature measurement: $\pm 1\text{ }^{\circ}\text{C}$.

4.6 Test fluid

Test fluid shall be water with a temperature between $5\text{ }^{\circ}\text{C}$ and $40\text{ }^{\circ}\text{C}$.

5 Test procedure

5.1 Test conditions

5.1.1 Permissible measurement fluctuations

The permissible measurement fluctuation amplitude of each measurement value is given in Tables 4 and 5.

If the fluctuations amplitude is greater than these values, the measurements shall be performed through a damper device. The damper installation shall not affect measurement accuracy: use a linear, symmetrical response device.

Table 4 — Differential pressure fluctuations

Value of ζ	Fluctuations on Δp %
$\zeta > 20$	± 6
$4 < \zeta \leq 20$	± 10
$1 < \zeta \leq 4$	± 17
$0,1 \leq \zeta \leq 1$	± 26

Table 5 — Flow rate and pressure fluctuations

Quantity	Symbol	Fluctuations %
Flow rate	e_q	± 6
Upstream pressure	e_p	± 6

NOTE More information about accuracy is given in Annex C.