SLOVENSKI STANDARD
SIST EN 1267:2000

01-september-2000

Ventili - Preskuġanje pretoļ ne upornosti z vodo

Valves - Test of flow resistance using water as test fluid

Armaturen - Messung des Strömungswiderstandes mit Wasser als Prüfmedium

Appareils de robinetterie - Essai de résistance a l'écoulement utilisant l'eau comme fluide d'essai

Ta slovenski standard je istoveten z: **EN 1267:1999**

ICS:

23.060.01 Ventili na splošno Valves in general

SIST EN 1267:2000 **en**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 1267

September 1999

ICS 23.060.01

English version

Valves - Test of flow resistance using water as test fluid

Appareils de robinetterie - Essai de résistance à l'écoulement utilisant l'eau comme fluide d'essai

Armaturen - Messung des Strömungswiderstandes mit Wasser als Prüfmedium

This European Standard was approved by CEN on 16 August 1999.

CEN 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 CEN 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 CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Contents

Foreword

This European Standard 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of an identical text or by endorsement, at the latest by March 2000, and conflicting national standards shall be withdrawn at the latest by March 2000.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association. This European Standard is considered to be a supporting standard to those application and product standards which in themselves support an essential safety requirement of a New Approach Directive and which make reference to this European Standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This standard specifies a method for determining the pressure loss and fluid flow rate through valves in piping systems using water as a test fluid. This method is suitable:

- for valves with low ζ values but higher than 0,1 by determining pressure loss, with respect to fluid flow rate and density;
- and to valves with equal inlet and outlet nominal sizes.

Industrial-process control valves are out of the scope.

NOTE 1 If using air as a test fluid, other standards e. g. EN 60534-2-3 and ISO 6358 should be referred to.

NOTE 2 For valves with flow resistance coeficient ζ values lower than 0,1, the pressure loss through the valve is very low with respect to the pressure loss in the test tubes, and ζ values cannot be determined with an acceptable measurement accuracy.

2 Normative references

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.

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

EN 736-3, *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 60534-2-1, *Industrial-process control valves – Part 2: Flow capacity – Section 1 : Sizing equations for incompressible fluid flow under installed conditions (IEC 60534-2 :1978).*

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

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

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

ISO 65, *Carbon steel tubes suitable for screwing in accordance with ISO 7-1.*

ISO 1127, *Stainless steel tubes - Dimensions, tolerances and conventional masses per unit length.*

ISO 4006, *Measurement of fluid flow in closed conduits - Vocabulary and symbols.*

ISO 4200, *Plain end steel tubes, welded and seamless - General tables of dimensions and masses per unit length.*

ISO 6358, *Pneumatic fluid power - Components using compressible fluids - Determination of flow-rate characteristics.*

ISO 7194:1983, *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.*

ISO 7598, *Stainless steel tubes suitable for screwing in accordance with ISO 7-1.*

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply:

3.1
Valve types
see EN 736-1

3.2
Flow coefficient (K_v or C_v)
see EN 736-3

3.3
Flow resistance coefficient ζ
see EN 736-3

3.4
DN (nominal size)
see EN ISO 6708

3.5
Uncertainties
see ISO 4006

4 Test installation

4.1 General

The test installation(s) shall be in accordance with figure 1. The position of the components outside the frame shall be chosen by the laboratory.

For angle valves (1b) the valve under test and test length L_3 may be arranged to lay in a horizontal or vertical plane. For multi end port valves, additional test tubes of the same type shall be used in the same manner.

4.2 Test tubes

The lengths of the test tubes and the position of the pressure tapping points shall be in accordance with figure 1. The lengths are measured from the ends of the test tubes.

If the test installation has upstream, two elbows in series and in different planes, it is necessary to make L_1 longer than 10 D unless a flow straightener is installed before the upstream test tube. If a flow straightener is used, the length L_1 may be shorter than 10 D provided the conditions in 5.1. are satisfied.

Further details of flow straighteners shall be found in clause 6 of ISO 7194:1983.

The test tubes shall be straight, the ends shall be cut square and deburred, and the internal surfaces shall be clean and without obstructions when inspected visually. The internal diameters are chosen by the valve manufacturer if not stated in relevant valve, product or performance standard. For valves with low ζ-value, the results obtained will be affected by the internal diameter of the test tube. Therefore, it is necessary to record the actual internal diameter of the test tube (see 7.2).

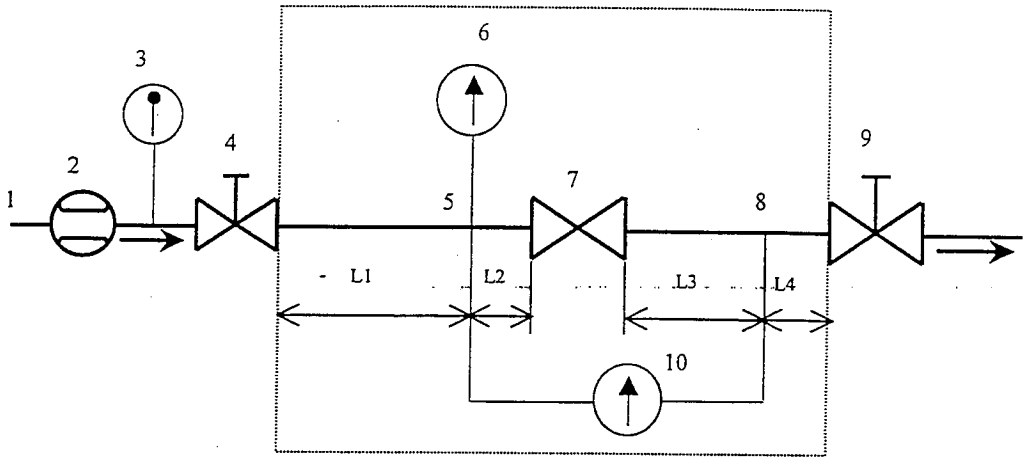
Note When new test tubes are made, it is recommended to make them in accordance with annex A.

The number of holes for the pressure tappings shall be chosen by the laboratory. At each pressure point, there may be one, two or four holes, or a slit provided excentricity is avoided. Four tapping holes are recommended for DN > 300.

The diameters of the pressure tapping holes shall be in accordance with table 1 and the length shall be at least twice the diameter. The edge of the pressure tapping hole at the internal surface of the test tube shall be sharp and free from burrs. The axis of the pressure tapping hole shall intersect the axis of the test tube and be at right angle to it, with a maximum deviation of 5 °. Connecting tubes between the pressure tappings and pressure measuring devices shall have an internal diameter of at least twice the diameter of the tapping holes. In order to avoid dirt accumulation, no tapping hole shall be located at the bottom of the cross section.

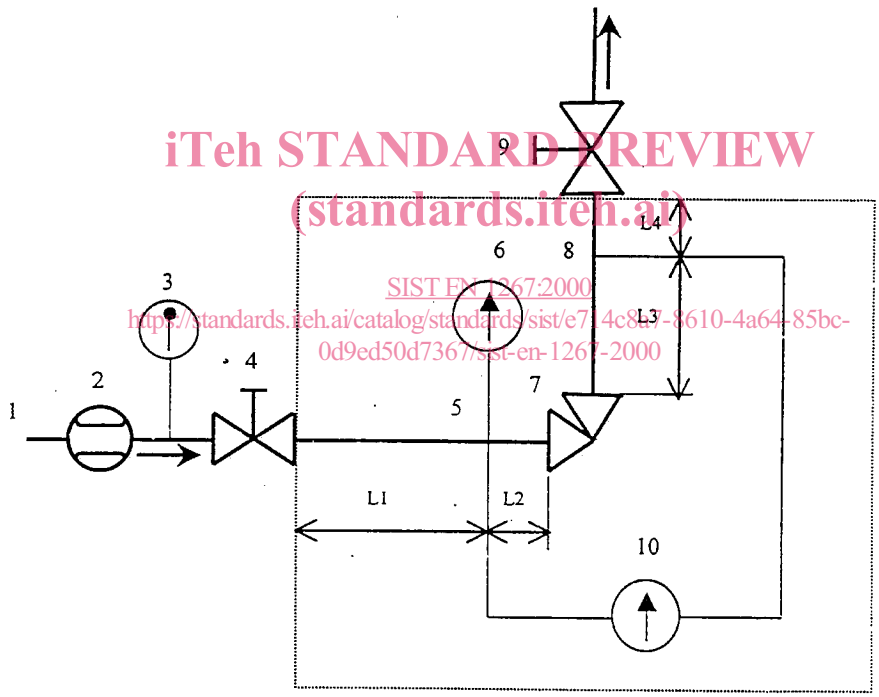
Table 1 - Diameter of pressure tapping holes in millimeters

DN	Min	Max
< 20	1,5	2
20 to 50	2	3
> 50	3	5



1a) STRAIGHT VALVES

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



1b) ANGLE OR MULTIPORT VALVES

D = Internal diameter of test tube

Legend

1	Water supply	6	Upstream pressure measuring device
2	Flow meter	7	Valve under test
3	Thermometer	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

4.3 Measuring equipments

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

Devices or methods which are known by calibration or references to other standards to result in a measurement with a systematic uncertainty not exceeding the maximum permissible values shall be used.

The maximum values of systematic uncertainties allowed for each kind of measurement by this standard are :

- upstream pressure, differential pressure and flow rate measurements : ± 2% ;

- temperature measurements : ± 1°C.

4.4 Test fluid

Test fluid shall be water with a temperature between 5 °C and 40 °C.

5 Test procedure

5.1 Test conditions

5.1.1 Permissible fluctuations in measurements

For each quantity to be measured, the permissible amplitude of reading fluctuations is given in tables 2 and 3.

If fluctuations of greater amplitude are present, measurements may be carried out by providing a damping device. The installation of the damping device shall not affect the accuracy of the readings: use shall be made of symmetrical and linear damping device.

Table 2 - Differential pressure fluctuation

ζ value	Δp fluctuations
$\zeta > 20$	± 6 %
$4 < \zeta \leq 20$	± 10 %
$1 < \zeta \leq 4$	± 17 %
$0{,}1 \leq \zeta \leq 1$	± 26 %

Table 3 - Flowrate and pressure fluctuation

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

For details about uncertainties, see annex C.

5.1.2 Steady conditions (see enclosed examples)

Test conditions are called steady if the mean value of all the quantities measured are independent of time. In practice, test conditions may be regarded as steady if the variations of each quantity, observed at the test operating point for at least 10 s, do not exceed a value of 1,2 % (difference between largest and smallest readings of the quantity related to the mean value).

If this condition is met, and if the fluctuations are less than the permissible values given in 5.1.1, only one set of readings of individual quantities will be recorded for the test point considered.

5.1.3 Permissible unsteady conditions

Where the unsteadiness of test conditions rises, the following procedure shall be followed:

At each test point repeated readings of the measured quantities shall be made at random intervals of time, but not less than 10 s (A minimum of three sets of readings shall be taken at each test point.).

The percentage difference between the largest and smallest values of each quantity shall not be greater than that given in the following table. (This will result in overall measurement uncertainties not greater than those given in 6.3.1).

Table 4 - Permissible difference between the largest and smallest values of reading

Number of sets	Permissible difference between the largest and smallest values of readings each quantity, related to the mean value (%)
3	1,8
5	3,5
7	4,5
9	5,8
13	5,9
> 30	6,0

The arithmetic mean of all the readings for each quantity shall be taken as the actual value for the purposes of the test.

In the case where the excessive variation cannot be eliminated, the limits of error may be calculated by statistical analysis.

5.2 Pressure loss in test tubes

In order to eliminate the influence of the portion of the test installation between the pressure tapping points on the flow characteristics obtained for the valve under test, flow rates and corresponding pressure drops of the said portion shall be determined as follows.

For each nominal size of test tube, connect the tubes concentrically against each other, without clearance between the ends in the test installation shown in figure 1.

Supply a flow of water to the test installation ensuring all air is vented.

Record a series of flow rates and corresponding pressure losses in the same flow rate range as used for testing the valve.

Determine the relationship between flow rate and pressure loss for the test tubes. Retest this relationship periodically, particularly if the internal surface condition of the tubes is likely to change. When the ζ-value of the valve is very low, it is recommended to measure in the same test program the pressure loss of tube and pressure loss of the valve-tube set with the same configuration, the same measurement devices.

When the ζ-value of the valve is high, other methods to determine the pressure loss in the test tubes may be used provided the permissible uncertainties in 5.1 are not exceeded.

5.3 Test of valve

The flow characteristics of the valve are established by mounting the valve in the test installation shown in figure 1, obtaining the flow characteristics inclusive of the test tubes and subtracting from them, the flow characteristics obtained for the test tubes only, as determined in 5.2.

For valves with internal pipe thread in accordance with ISO 7-1, the thread engagement between valve and test pipe shall be as given in table 5.

For valves with other thread lengths the thread engagement shall be equal to the actual length of useful thread of the valve.